PUBLIC WORKS

Sept. 1960

CITY, COUNTY AND STATE

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LAND IRRIGATION PLAN Uses Sewage Effluents page 119

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Emmett H. Karrer, Professor of Highway Engineering with The Ohio State University since 1949, was with the Bureau of Public Roads for the 16 years preceding. More details on page 19.

SNOW MUST GO!

—when you use Snow Plow and Wing Attachments on your GALION Graders

Galion "V" type Snow Plows are sturdily constructed and braced for heavy-duty service. Renewable cutting edge of high carbon steel. Sliding shoes, with renewable wearing plates, prevent plow from digging into the road surface. Plow is independently operated by the hydraulic system of the grader and is controlled from the cab.

Plows slice through deep snow with a minimum of resistance. The heavy weight and powerful tandem drive of Galion Graders combined with Galion Snow Plows enable you to clear maximum mileage of roads per hour of operation. Made in sizes to fit every model grader in the Galion line.

The Galion Snow Wing facilitates removal of snow from road shoulders, and is a great help in cutting down high drifts. The hydraulic pump (driven by grader engine) is used to insure quick and accurate adjustment of Wing and "V" Plow independent of grader operation. The Galion Wing has a four-foot lift adjustment from ground level and an angle adjustment of approximately 45° providing an 8 ft. cutting height. When not in use, Wing folds back close to grader.

Write for literature.

THE GALION IRON WORKS & MFG. COMPANY
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ESTABLISHED 1907

MOTOR GRADERS & ROLLERS
VIBRATORY COMPACTORS • PNEUMATIC TIRE ROLLERS

"from Chicago" An available① means for increasing digester performance

by insuring Homogeneous Sludge through

CONTINUOUS MIXING

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Sludge Digestion System

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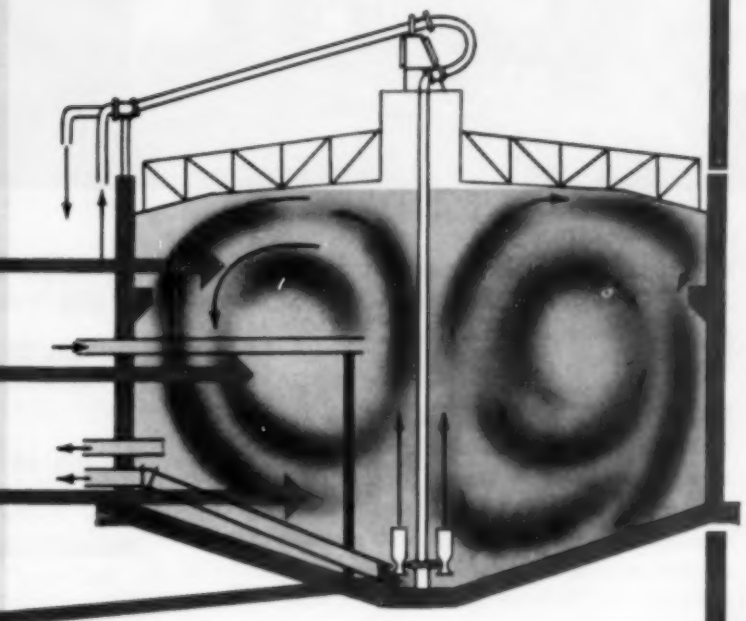

Scum free due to outward radial flow at surface

Greatest loading capacity for accelerated digestion

Continuous Tank Homogeneity and thorough mixing

Highest mixing capacity . . . bottom diffusion with clog-proof GasFusers② assures total tank mixing

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②"GasFuser" Continuous Gas Recirculator

55 operating and specified installations of the CRP* System with "Chicago" gas mixing equipment since 1955 prove its unparalleled acceptance...serving cities from 2000 to 250,000 population.

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Putting Ideas to Work

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CHICAGO PUMP

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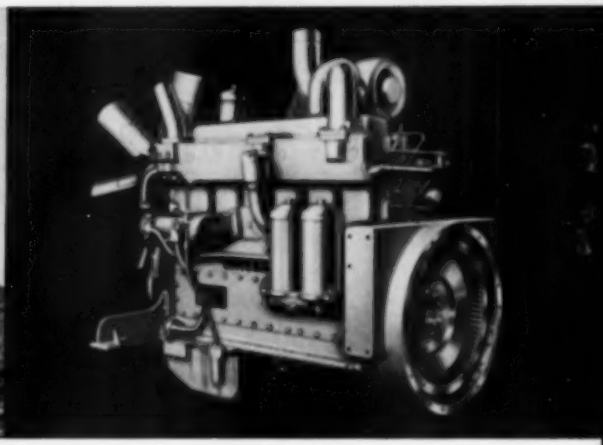
NEW CAT NO. 14 SERIES C MOTOR GRADER

Compact engine plus many other refinements assure top performance, easier servicing, long life



Important changes make up the new Series C No. 14 Motor Grader—big improvements throughout to give you better performance, long life and servicing ease:

NEW COMPACT 150 HP ENGINE The short, rigid block and stress-relieved crankshaft give greater strength and shock resistance. New cylinder head design resists distortion yet has superior cooling characteristics. Large water pump with cast-iron impeller, ceramic seal face, and carbon type seal combined with a 20 per cent increase in radiator capacity improves cooling, lengthens life.

NEW STARTING ENGINE All-weather starting with this new two-cylinder vertical gasoline engine is assured. Replacing the horizontal engine, this design features aluminum pistons and overhead valves for improved performance. Bore is 2.38", stroke is 2.38", and compression ratio is 8:1. Over-running clutch in starter pinion prevents damage to starter engine when diesel starts, a year-round starting plus.

NEW SERVICING EASE An advanced fuel system is designed for easier servicing and more efficient operation. Compact fuel injection pumps with barrel and plunger assemblies enclosed in housing help reduce wear, lengthen service life.

Plus all the features that made the No. 14B the most versatile motor grader in the "big machine" field . . .

EXCLUSIVE OIL CLUTCH—provides up to 2000 hours of service without adjustment, equal to about a year of "adjustment-free" operation.

DRY-TYPE AIR CLEANER—removes 99.8 per cent of all dirt from intake air. Can be serviced in five minutes.

MECHANICAL CONTROLS—provide easy engagement. "Anti-creep" lock makes blade stay put under load.

FULL VISIBILITY—operator has unobstructed view of job even while seated.

Now, all Cat Motor Graders feature the compact engine. Like the new No. 14C, the 85 HP No. 112E, the 100 HP No. 112F, and the 115 HP No. 12E are all designed to give you the highest production at the lowest possible cost. Get the full story from your Caterpillar Dealer. Let him prove by actual demonstration how Caterpillar can save taxpayers' money in your community.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

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BEST BUY FOR
YOUR TAX DOLLARS**

PUBLIC WORKS

THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATE

SEPTEMBER, 1960 • Volume 91, Number 9

The Science of Winter Maintenance 89
Introducing a series of articles on the planning, equipment and materials that are employed by engineers to keep traffic on the move.

Snow Fighters Operate Like Military Forces 90
A peace-time battle with a formidable enemy—snowfall—finds Indiana's maintenance forces organized with military precision. H. J. KEIL

Minneapolis Sends Snow Down the River 92
Disposal of snow removed from downtown streets is always a problem. Here's the efficient system used by Minneapolis. E. H. LUND

Snowfall is Challenge of Airport Maintenance 94
To keep air transportation open, the same skills used on highways are needed for clearing runways and taxiways. DOUGLAS C. WOLFE

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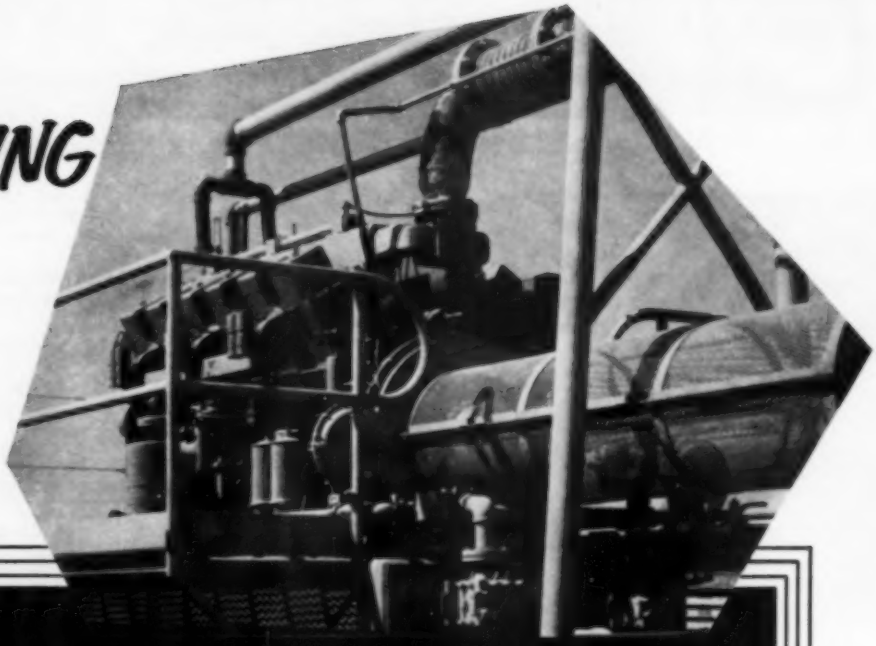
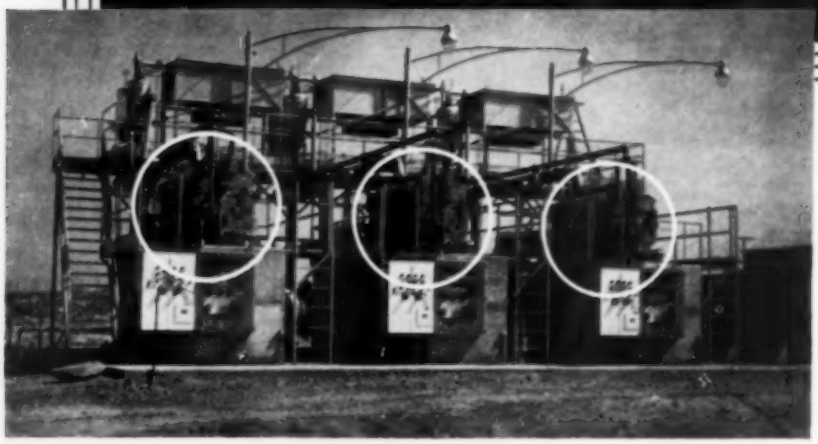


three CLIMAX V-122 ENGINES power outfall booster pumps



At Orange County, California, Sanitation District, Plant 2, three *Johnson* vertical flow centrifugal type outfall booster pumps are powered by three V-122 *Climax* 3232 cu. in. engines: 12-cyl., 60° V-type, 7" bore x 7" stroke. Engines are equipped with ebullient cooling, full automatic starting and speed regulation; burn sludge gas, with natural gas for standby, and drive through *Western* BSV-144 right angle gears, ratio 2.1304:1.

In the Orange County treatment plant, ordinarily the treated sewage flows by gravity from the plant through a 3000 ft. long outfall conduit to the ocean. But an increased inflow to the plant, or a high tide, or a combination of both, causes the outfall forebay fluid level to rise. At a predetermined point Pump Unit No. 1 starts, warms up, then goes on the line. Further increases in fluid level bring Pump Units No. 2 and No. 3 into action, when necessary. The three Climax Engine powered Pump Units can handle maximum flow at the highest tide, and then some. With a decrease in outfall forebay level, the operation reverses—the units dropping off as need diminishes. For sewage treatment plants—seven rugged Climax Engine models . . . 12, 8, and 6 cylinders, burning sludge gas, or capable of operation on natural gas, butane, gasoline, or any combination . . . ranging from 100 hp to over 600 hp. Write for engine bulletins.

CL-118

CLIMAX ENGINE MANUFACTURING CO. • DIVISION OF WAUKESHA MOTOR COMPANY

FACTORY—CLINTON, IOWA

Public Works Engineers Deserve Recognition

A NATIONAL Public Works Week has been designated for the period of Oct. 2 to 8. Proclamations are to be issued nationally, at the state level and locally. It is a fine and proper thing to recognize the essential work that public works engineers and employees do every year and the year around; in the snows of winter and the heat of summer; in times of flood and during drouth; in emergencies and in day-by-day application. A further step in the right direction will be the selection of the ten top public works men of the year. For this whole program, credit must go to the American Public Works Association and Kiwanis International. A much needed and enhanced citizen awareness of the importance of public works people and of the work they do should be forthcoming as a result.

Raking Muck Over the Interstate Highway System

A MOST regrettable article appeared recently in a popular magazine. In effect, it charged that the Interstate Highway program was pretty much a mass of blunders from end to end. It is, of course, easy to find errors in a project of this magnitude, and it is easy to stress such errors and to omit entirely any mention of the overwhelming amount of good work that has been done. To quote one engineering society which investigated some of the accusations made, this article "is a great disservice to the great majority of sincere and honest individuals and firms involved in the work and should be so recognized by the American public."

Your editor read as much of the article as he could take and threw the rest of it away as particularly poor junk.

Census Returns Reemphasize Exurban Public Works Problem

THOUGH MANY signs in recent years have pointed to the growth of suburban and exurban areas at the expense of our cities, the reports to date of the 1960 census have just about made this official. This does not mean that our cities are going out of business, but it does mean that a new look and strong action are going to be needed, beginning, as the saying goes, yesterday, to meet the problems accompanying this shift.

Builders go outside of city limits because of many reasons, including more and cheaper land, lower taxes, less onerous regulations and the desires of home buyers for lawn space and trees. Water supply usually can be obtained; the developer can build streets; but sewerage, lighting, refuse collection and storm water control are something else again.

We suggest that every governor set up a study group to determine the best policy for handling these problems in his state. Engineering, legal, health, political science and safety representatives are needed. Our system of government is not now fitted to meet these rural area problems. The old procedure of incorporation at leisure, or formation of a sanitary or other district after the situation has become practically intolerable, is inadequate. New concepts and new and effective procedures are needed and have been for a long time.

A Problem on Hydraulics of Trickling Filters

ONE OF OUR readers has asked us to discuss the hydraulics involved in the design of the central drainage channel of a trickling filter. While the flow in such a channel will have some of the characteristics of the flow in the wash water trough of a rapid sand filter, conditions are not nearly so severe. The small flow from the many underdrains discharging to the channel will have some disturbing effect on the channel flow but not to the extent that the wash water trough flow formula will be applicable. We will be interested in hearing about the practices of our readers in computing flow in these trickling filter channels.

Highway Equipment Replacement by Counties

A STUDY NOW under way by the Editors of this magazine indicates that replacement of equipment used in highway construction and maintenance averages about $44,000 per county per year. Likewise the present or depreciated value of equipment on hand is about $370,000 per county. These are median figures based on 246 counties in 30 states. The study is being continued and more data will presently be available. The need for modern equipment to service properly and economically the growing mileage of surfaced roads and to expedite the increasing flow of traffic appears to be critical. In too many areas, worn-out equipment, no longer economical to use, is continued in service far beyond its effective life.

THE MARK OF THE 100-YEAR PIPE

PERMANENTLY YOURS: CAST IRON PIPE

Installed... it stays installed

One thing sure about cast iron pipe—once it's in the ground, it's there for keeps! Over 100 American utilities, having used cast iron pipe steadily for more than a century, can testify to that. And *modern* cast iron pipe gives you greater assurance than ever: great beam strength resists heavy surface traffic; tremendous load resistance absorbs even the most forceful pressures. In fact, when you select cast iron pipe, you can anticipate no major repairs in your water supply system for the next hundred years!

Cement-lined—it stays cement-lined

A smooth coat of cement lining along the inner wall helps prevent the formation of flow-reducing particles. No matter how strong the water is, cast iron pipe always assures a free, steady flow.

Joined—it stays joined

Bottle-tight, rubber-ring joints give you leak-proof protection at the most vulnerable points of your system. Vibrations, surface traffic and washouts present no problem to cast iron pipe. Inherent ruggedness . . . built to perform under all adverse underground conditions . . . repair-free service for at least a century—all good reasons why your choice should be that of water utility experts everywhere. America's greatest water carrier: cast iron pipe.

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 3440 Prudential Plaza, Chicago 1, Illinois

CAST IRON PIPE

COLOR ADDS A NEW DIMENSION FOR SAFER HIGHWAY MARKING

...Parlon keeps it bright

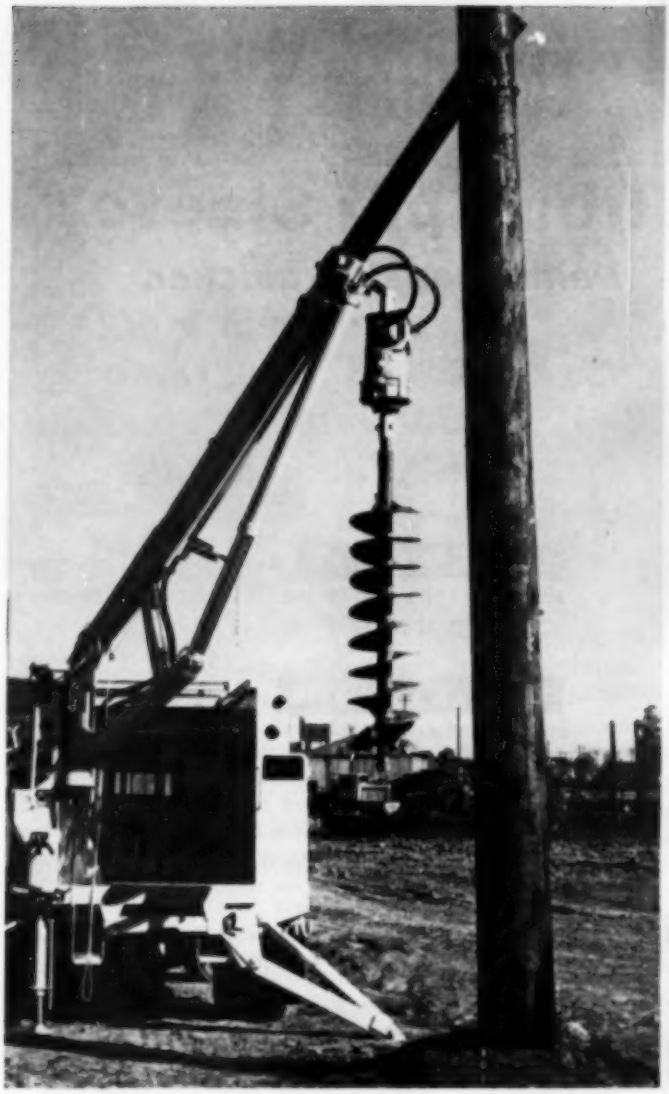
Colored traffic paint has been in use for several years as a special signal—for instance on the green crosswalks used in so many communities to protect school children and pedestrians. Here is an extension of that application, being used with notable success by an Eastern state on its most heavily travelled highways.

The use of color—a brilliant green approximating the grassy areas of island and median strip—provides a distinctive run-out area on the pavement before the vehicle comes in contact with curb or barrier. This is particularly effective where traffic-stream divergences, cross paths, and other unexpected pattern irregularities exist to confuse the high-speed motorist. The color areas advise the motorist of the impending change, guide him to the correct lane markings, and give, where necessary, a safe haven for stopping before the curb is mounted.

In these new uses for color on street and highway surfaces, as in all conventional striping, laning, edge-marking, and stenciling applications, traffic paints made from Parlon® chlorinated rubber can be depended on for long life and for the fast dry that opens the roads to traffic sooner. Ask your regular paint supplier for the test data on Parlon that proves these values. Or, if you prefer, write for a showing of the motion picture "Highway Life Lines" which tells how the right paint can be safely and easily selected and specified.

Cellulose Products Department
HERCULES POWDER COMPANY
INCORPORATED
Wilmington 99, Delaware

CR60-1



Semi-automatic device locks borer on end of extendible boom for digging.

Borer automatically locks to end of main boom when retracted, leaving extendible boom free for pole setting.

Diagnosis: High Feed Pressure

Strongest corner-mounted derrick in the field is Holan's 7500 — a powerful, time-saving derrick that operates in an arc behind and to the right side of the truck.

Here's power . . . real power . . . all the up and down feed pressure needed to drive any derrick-suspended digger. And more than that, it's the only corner-mounted derrick built capable of handling Holan's rugged 3-speed 5400 Earth Borer.

Jobs can go ahead on schedule — even in alleys, narrow streets and congested areas because positioning problems are ended. Parked parallel to the curb, the 7500 swings over . . . even over fences and guard rails . . . reaches out . . . and digs deep holes, sets poles up to 70 feet in length.

The 7500 is engineered as a complete unit to avoid body and derrick stresses . . . can "live boom" 8,500 pounds, winch 10,000 pounds.

A semi-automatic locking device moves the earth borer onto the extendible boom for digging . . . or to its main boom storage position.

The 7500 . . . shown here mounted on the left side . . . is available mounted on the right side. It reaches up 27'-6", 18½' behind the truck, and beyond the right side 12'-3" (left-side mount) and 16'-10" (right-side mount) with boom extended.

Before you buy any corner-mounted derrick, write us — or call your Holan Field Representative — for complete details.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

Holan

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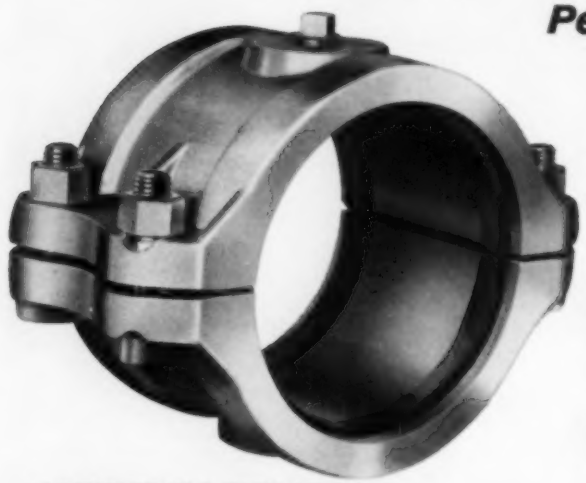
NEW CLOW

Ductile Iron Split Sleeve

Permits easier, quicker, permanent repair of 4", 6" & 8" transverse cast iron pipe underground breaks



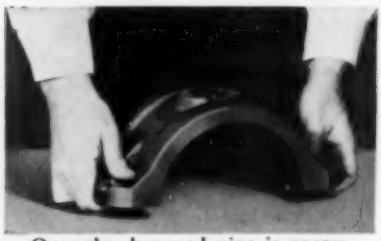
LIGHT WEIGHT Assembled 4" diameter sleeve weighs but 26 lbs. Weight of 6" sleeve is 32 lbs., 38 lbs. for 8" sleeve.

SHORT LENGTH Effective length of 4 inches between end seals on all sizes. Overall length is 6¼".

TWO-PIECE ASSEMBLY No end glands. Side and end gaskets are pre-assembled and cemented in sleeve grooves.

HIGH STRENGTH All parts are high tensile and corrosion-resistant. Sleeve halves are 70,000 psi tensile ductile iron. Nuts and bolts are high strength, corrosion-resistant alloy.

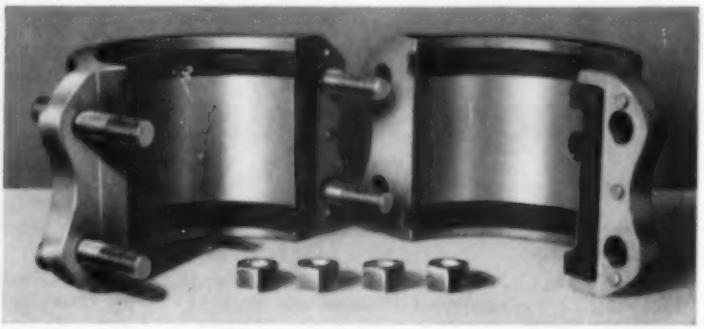
ASSEMBLED IN 3 EASY STEPS



Once the damaged pipe is uncovered, one half of the sleeve is placed on each side of the pipe.

Sleeve halves are drawn together. Pre-assembled rubber gaskets make tight seal.

After the bolts are taken up finger-tight, tightening the four bolts by wrench completes assembly.



HERE'S ALL THERE IS TO IT! Illustration shows two-piece glandless construction. Side gaskets overlap ends of circumferential gaskets for tight seal. Four bolts are only accessories. Tapping boss on each half allows maximum tap of 2 inches. Regularly furnished with one sleeve-half tapped for ¼" pipe.

JAMES B. CLOW & SONS, INC.

201-299 North Talman Avenue • Chicago 80, Illinois

Subsidiaries:
Eddy Valve Company, Waterford, New York
Iowa Valve Company, Oskaloosa, Iowa

Proved performer on county work **BANTAM T-350**

"For county work BANTAM has no equal"

"It's where we need it when we need it"

"There's just no comparison between BANTAM and other machines"

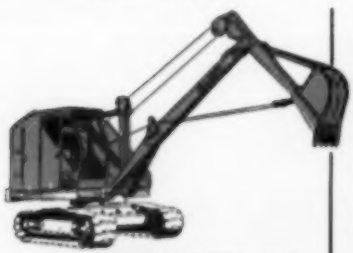
Carrier-mounted BANTAM T-350 loads out 600 yards of material in an 8½-hour day, excavating pit-run sand and gravel.

Down Mississippi way, you'll hear these comments from the men in the Pearl River County Beat (District) 4 Highway Department where their second BANTAM is speeding up road-building and other work. Pearl River chose BANTAM again because BANTAM's high speed, dependability and lowest-of-all operating cost make it the ideal machine for all types of excavating, lifting and handling jobs. County Supervisor W. E. Moody says, "For county work, BANTAM has no equal."

For excavating, loading, ditching, pile driving, culvert installations, materials handling, bridge construction or repairs, BANTAM's big-rig features and exclusive engineering advantages assure Pearl River the highest return on its BANTAM investment. BANTAM's job versatility has proved itself time and again over the 260 miles of road in the district.

Size-up BANTAM for your work!

Let us prove to you why BANTAM is the most useful, all-round rig for cities, towns and counties—the wisest investment on *every* count!



BANTAM C-350—New crawler rig features an all-new undercarriage with extra stability; standard 2-speed, independent travel, and a wide choice of options. 7- and 8-ton capacity.

BANTAM CR-350—All-new self-propelled travels and works with one engine and one operator . . . offers automotive power steering, independent travel, and new, higher travel speeds. Capacity to 11 tons. 4 x 2 drive standard . . . 4 x 4 optional.

BANTAM, with clamshell bucket, prepares drainage ditch for new road. BANTAM's operational ease and big-rig speed help it to outproduce any other in its class.

With its 11 quick-change attachments, BANTAM is ready to work anywhere. What's more, 25 optional features enable you to buy your BANTAM exactly as you want it—to fit your specific job needs.

PW-261

SCHIELD **Bantam Co.**

301 Park Street, Waverly, Iowa

WORLD'S LARGEST PRODUCER OF TRUCK CRANE-EXCAVATORS

On hundreds of Skylines...

HORTON® ELEVATED STEEL WATER TANKS

... products of CB&I

Craftsmanship in Steel

Go North . . . East . . . South . . . West . . . you'll see Horton Elevated Steel Water Tanks on the skylines of America's *most progressive* cities. Landmarks of municipal progress, these structures combine beauty and prestige with efficient water system planning.

Horton tanks are designed to satisfy the increased water requirements of growing communities. They provide dependable gravity pressure water storage and assure these benefits:

- Reduced pressure variations
- Reduced pumping cost
- Increased water pressure
- Fire and emergency reserves
- Welded construction providing trouble-free service life with a minimum of maintenance
- All CB&I structures are built to AWWA standards

The specific answer to your water storage requirements can be found in the wide range of capacities and designs of modern elevated structures offered by CB&I:

WATERSPHERES® are graceful and contemporary in design. They provide maximum storage capacity in a functional, easy-to-paint and maintain structure. They are available in capacities from 25,000 to 250,000 gallons.

WATERSPHEROIDS® are big brothers to Waterspheres, differing only in size and shape. Waterspheroids range in capacity from 200,000 to 500,000 gallons. Both structures are designed to allow use of the base of the column as a pump or storage house . . . eliminating the need and expense for separate buildings. *Write for Watersphere and Waterspheroid Bulletin.*

SPHEROIDAL TANKS are available in several variations of the basic design to meet individual requirements. Capacities range from 200,000 to 3,000,000 gallons. They can be built with a large central riser in smooth or a fluted design; or the central portion can be supported on an inner circle of columns. *Write for Bulletin on Horton Elevated Tanks of Large Capacity.*

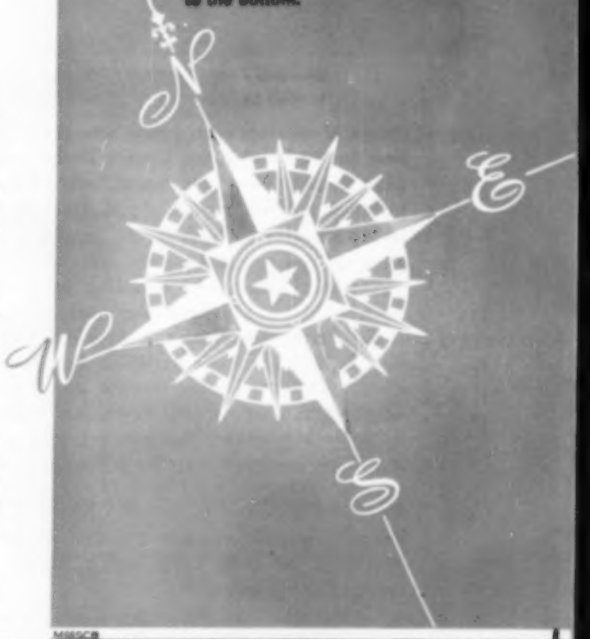
ELLIPSOIDAL-BOTTOM TANKS provide relatively large diameter and shallow depth. They have pleasing proportions and reduce the variation in pressure as water is used from them.

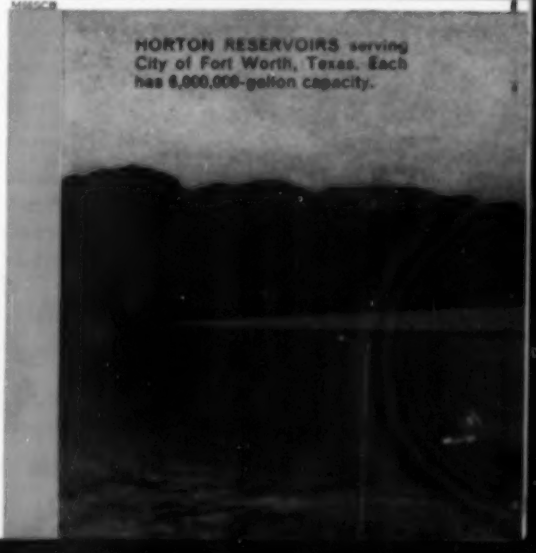
RADIAL-CONE TANKS provide the advantages of elevated storage in a tank of large capacity with a low range in head. They have smooth lines, are easy to maintain and are available in capacities up to 3,000,000 gallons. Can be furnished with or without a balcony.

STANDPIPES fulfill the water storage needs of many communities. Horton structures are particularly adaptable to special decorative treatment if desired. (See photo.)

STEEL RESERVOIRS provide gravity pressure where natural elevations are available or where large storage capacity is needed at ground level. They can be designed to meet *any size* or capacity requirements. A variety of roof types can be furnished. Horton *Steel* tanks will not crack or leak due to uneven settlement. Routine preventive maintenance will provide long service life. *Write for a copy of Horton Steel Reservoirs and Standpipes.*

WATERSPHERE at Griffith, Indiana has 200,000-gallon capacity; is 98 ft. to the bottom.



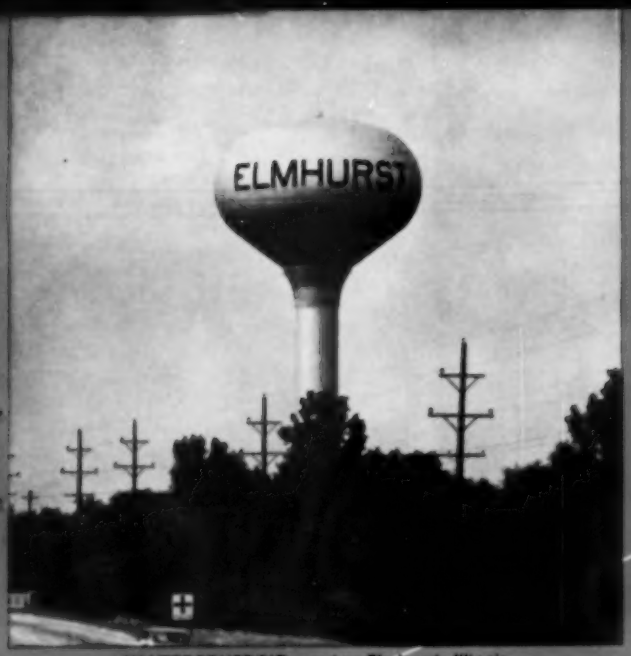


HORTON RESERVOIRS serving City of Fort Worth, Texas. Each has 6,000,000-gallon capacity.

CHICAGO BRIDGE & IRON COMPANY

332 SOUTH MICHIGAN AVENUE
CHICAGO 4, ILLINOIS

OFFICES AND SUBSIDIARIES IN PRINCIPAL CITIES THROUGHOUT THE WORLD



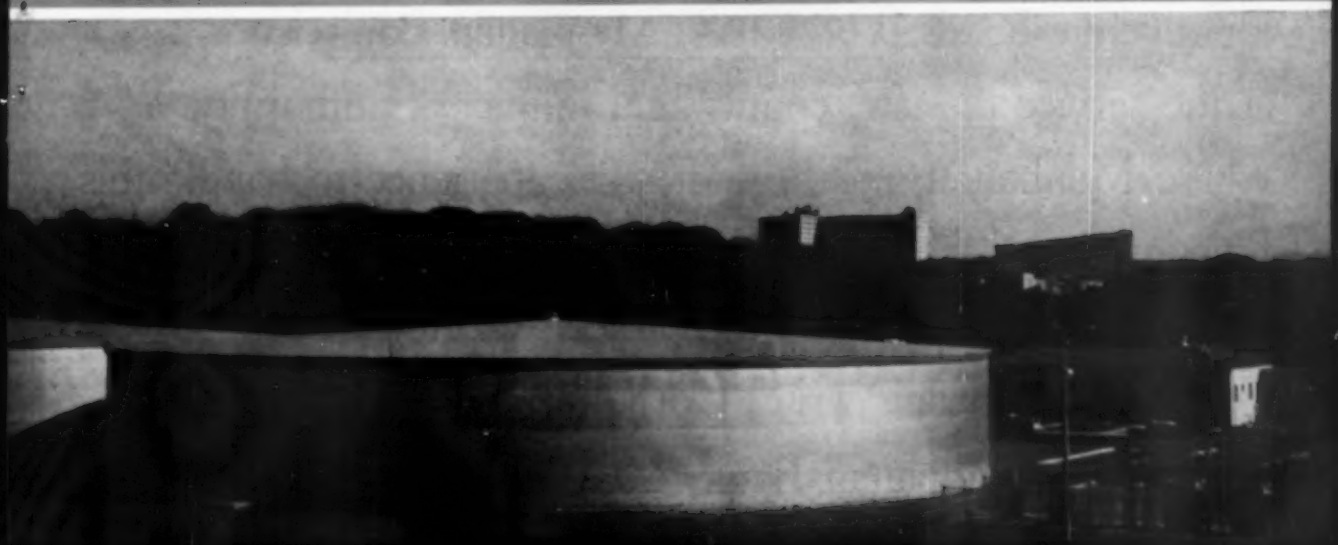
WATERSPHEROID serving Elmhurst, Illinois has 500,000-gallon capacity; is 109 ft. to bottom.

SPHEROIDAL elevated tank at Wheaton, Illinois is 130 ft. to bottom; has 1,500,000-gallon capacity.

ELLIPSOIDAL-BOTTOM tank at Bremen, Indiana has 200,000-gallon capacity.

RADIAL-CONE elevated tank at Manhattan, Kansas has capacity of 500,000 gallons.

ORNAMENTAL STANDPIPE at Clearwater, Florida has capacity of 1,000,000 gallons.



MODEL DAM BY R. S. BALDWIN

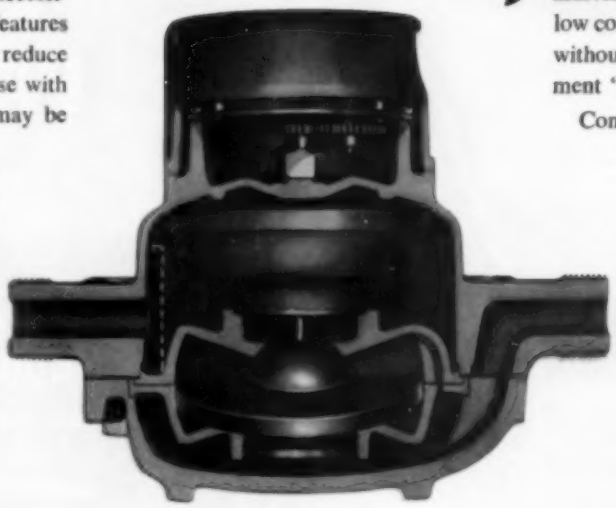
When it comes time to appoint a trustee or fiscal agent for revenue bonds, The Chase Manhattan Bank is at the service of state, county and municipal authorities. Chase Manhattan has the staff and experience to handle this function as trustee or fiscal agent in cooperation with banks in the areas where the projects are located. For complete details write: Corporate Trust Division, The Chase Manhattan Bank, 40 Wall Street, New York 15.

What Every WATER SUPERINTENDENT Should Know About

AMERICAN METERS

...Simplicity

Unequalled simplicity and accessibility of working parts are features of American Meters that reduce maintenance costs. The ease with which the internal gears may be lifted from their bearings or the disc chamber taken from its seat and opened is a revelation to anyone who has not seen it. And, best of all, you can't put the parts of an American Meter together incorrectly. They just won't fit in the wrong place.



American Meters have full interchangeability of individual parts, which permits the low cost rebuilding of worn meters without buying expensive replacement "unit assemblies".

Combine all this with the finest materials and workmanship and you have the reason why water superintendents who know American Meters continue to purchase more, year after year.

All the cost-saving features of American Meters are described in Bulletin 58. We will be glad to mail you a copy on request.

BUFFALO METER COMPANY
INCORPORATED

2920 Main Street **Buffalo 14, New York**

CUT COLLECTION COSTS with UNMATCHED BIG SIX PERFORMANCE

Greatest operating economy starts with lowest maintenance costs and most productive time . . . and the Load-Packer 600 delivers economy proof in every one of its BIG SIX performance features.

1. **FASTEST OPERATION**—Crew starts reloading in just 4 seconds . . . full cycle takes only 10 seconds.
2. **GREATEST COMPACTION**—Direct thrust compaction packs more per yard than any competitive unit.
3. **BIGGEST LEGAL PAYLOADS**—Biggest loads on any given chassis for two reasons. First, dead weight is cut to a minimum; second, telescopic hoist eliminates heavy subframes and improves weight distribution.
4. **LARGEST LOWEST HOPPER**—Big 1½ cubic yard, 74 inch wide hopper, plus low loading height.
5. **SAFEST, MOST DEPENDABLE**—Controls are simple, foolproof. Operator has positive control. Fewer moving parts, less linkage, few adjustments.
6. **GREATEST ECONOMY**—Biggest hopper and fastest packing cycle cut fuel costs and equipment wear.

Start cutting collection costs now by having your GarWood-St. Paul truck equipment distributor tell you more about the Load-Packer 600 . . . with exclusive BIG SIX performance.

Emmett H. Karrer is professor of highway engineering in the department of civil engineering of the Ohio State University. Born in Dublin, O., Prof. Karrer received the degrees, BCE and CE from Ohio State in 1930 and 1935. With the U. S. Bureau of Public Roads for 16 years, he spent a year during World War II, as liaison representative with the War Production Board, developing control procedures on critical materials; later he was Bridge Engineer in Division II.

He joined the Ohio State teaching staff in 1949 and three years later won first place in the National Essay Contest of the AASHO, writing on "What I Advise My Students with Regard to Highway Engineering."

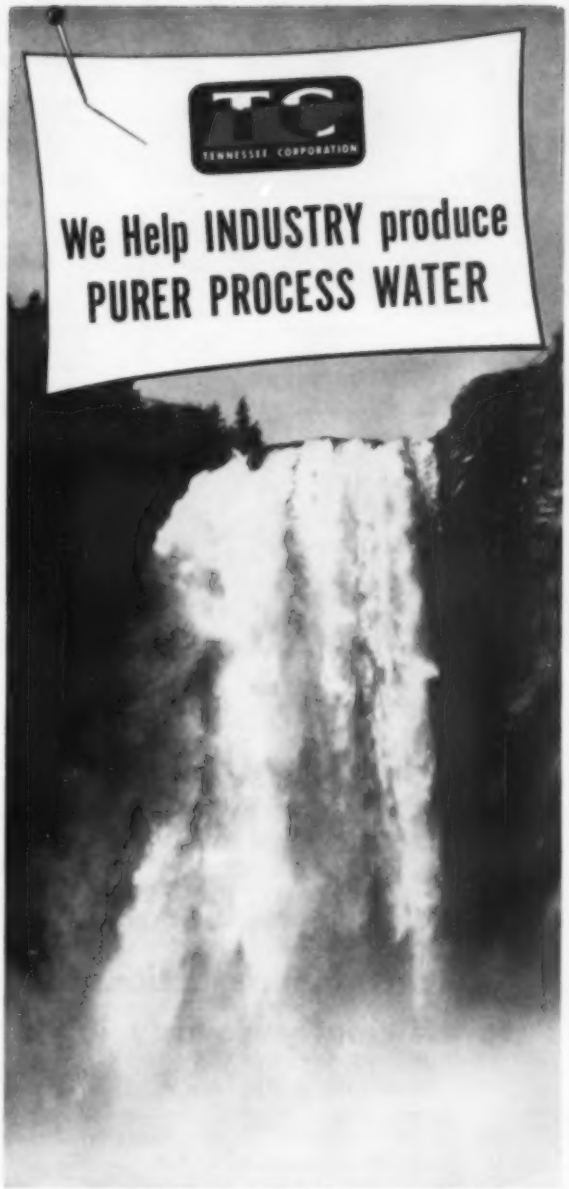
In 1951, Prof. Karrer toured Central and South America and the Caribbean Islands for the International Road Federation, analyzing the educational needs for speeding up road building. In 1954 he returned to Mexico to assist the National University of Mexico and the University of Pueblo in establishing curricula in Highway Engineering. In 1956, he made another visit to South America for the International Road Federation to check on progress in methods of education for highway engineering. Professor Karrer also presented papers at the World Highway Meetings in Rome, Italy in 1955 and Mexico City in 1958.

During the summers of 1957, 1958 and 1959 he served as a consultant for the Ohio Contractors Association. An outgrowth of this was a series of short courses for Supervisors for Highway Construction, the basic course of which will be repeated for the fifth time this winter. Advanced courses have been held for Supervisors of Earthwork Construction, Supervisors of Bridge Construction, and one is being planned for Top Management of Contracting Work.

Prof. Karrer is active in many engineering and honorary societies including Tau Beta Pi, Highway Research Board, and the Engineers Club of Columbus. He is president of the Education Division of ARBA, past chairman of the Executive Committee of the Highway Division of the ASCE, a member of the ASEE—AGC joint cooperative committee and serves as director of the Annual Ohio Highway Engineering Conference.

With wide practical experience, active participation in transportation problems on an international basis and current association with a great university, Professor Karrer is eminently qualified for his new relationship as Transportation Consultant for PUBLIC WORKS. In this capacity he will actively participate in the continued improvement of our editorial pages through informed planning, contacts with authors and readers, and direct authorship of current and informative articles in the field of transportation.

Professor Karrer lives, with his wife and sons Carl and Stanley in Dublin, Ohio where, when his world travels permit, he is also an enthusiastic and successfull gardener.



We know we can help you with Coagulation, Softening, Iron and Manganese removal, Corrosive Water and Filtration. We have years of experience in this field, and our FERRI-FLOC (Ferric Iron Sulfate) does an outstanding job in producing purer process water. And, of course, we offer reliable technical assistance — Let us tell you about it.

For complete list of our products see our inserts in Chemical Week Buyers' Guide, Pages 173-176 or Chemical Materials Catalog, Pages 551-554.

For Further Information, Write, Phone or Wire us.

TC TENNESSEE CORPORATION
612-629 Grant Building, Atlanta 3, Georgia

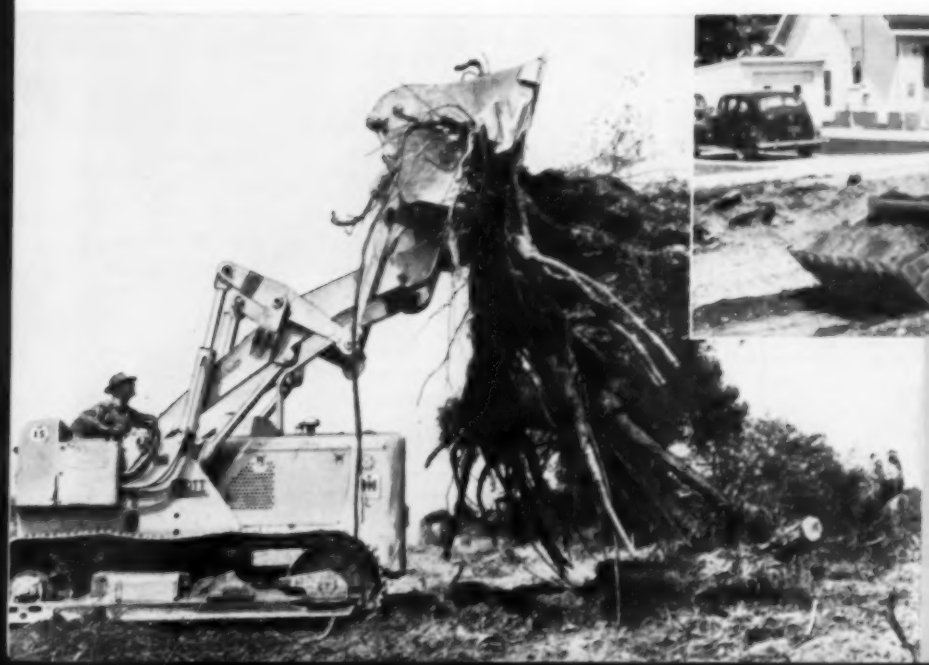
Sticky clay quits sticking—with exclusive 4-in-1 bottom dumping. Opening this clam pulls the material from bucket surfaces—gravity pull does the rest. You get positive 4-in-1 dumping, even of wet, sticky materials that idle ordinary, roll-forward buckets!

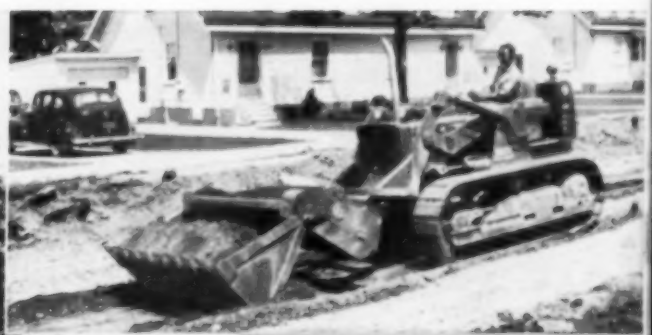
"Several machines in one save us time, labor expense, and additional equipment cost," states E. L. Quissenberry, Town Manager, Farmville, Va. Here their Turbocharged, 6-cylinder TD-9 Four-in-One is covering refuse evenly on-the-go with easily-controlled "carry-type scraper" action. Operator then uses compactor-plate action to *iron-down* the cover. No other rig even approaches 4-in-1 efficiency and economy operating the sanitary landfill!

Exclusive earth-pooling "carry-type scraper" action "boils" material into the bucket—as this new 6-cylinder TD-9 Four-in-One accurately grades for streets, sidewalks, and driveways in a new Cleveland, Ohio, suburb. Outfit practically eliminates handwork follow-up!

How to replace a whole spread of with a clam-action

Switch machine-actions <u>instantly</u> to efficiently do any job at hand!





"Greatest rig ever made for land clearing" declares operator K. G. Sanders. "We handle jobs ordinary loaders can't do." Clearing right-of-way for Big Dalton Flood Control Project near Covina, California. This TD-15 "clams on" to multi-ton stumps other buckets couldn't budge—loads these "impossibles," and wood-and-mortar building debris, with ease!

specialized rigs

4-in-1

Fingertip easy, you move the selector lever – to instantly switch the 4-in-1 to the machine action needed to do the job at hand!

Load, bulldoze, strip, cover, excavate, clear, compact, grade, develop sites, landscape, and also beat any other rig on the market operating the sanitary landfill. Any of the five clam-action 4-in-1 sizes (¾ to 3 cu yd) can give your community this exclusive versatility unlimited!

You get a whole equipment spread of actions in the clam-action 4-in-1. Each big-capacity action "doubles" for one or more specialized machines. You adjust and control hydraulically each 4-in-1 action, to get an amazing range of job-handling working positions!

Price all the machines the 4-in-1 can replace for your community – then total up the thousands of dollars you'd save with 4-in-1 ability to handle multi-operation jobs. See how only International Drott gives you 6-cylinder wallop and smoothness in all four diesel models—plus sintered metal faced engine clutch full-torque efficiency—plus exclusive dual-protected Dura Roller upkeep ease—plus exclusive, shock-swallowing Hydro-Spring performance protection! See your International Drott Distributor for a 4-in-1 demonstration!

"The 4-in-1 adapts to every job," reports J. J. Surovik, Franklin, Pa. "It gives all-around versatility to handle all phases of the work." Clamshell action "surrounds" loose materials—speedily heaps the bucket every pass. Preparing for paving an Erie, Pa., street, this TD-9 Four-in-One grades with inch-close accuracy!

Using "rock-busting" 4-in-1 pry-action to rip up old pavement and make way for a Toledo, Ohio, parking lot. Area is then leveled and graded, and prepared for resurfacing by the precisely-controlled, clam-action TD-6 Four-in-One! Pry-out force of the TD-6 is 18,600 lbs—and a whopping 43,000 lbs on the 3 cu yd TD-20!

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

INTERNATIONAL®
DROTT®

A Symbol of Quality
FOR
WATER
SERVICE
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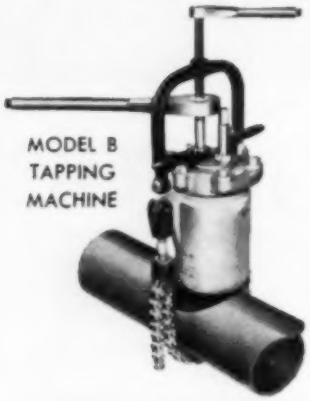

TAPPING
MACHINES

One of a complete line of Water Service Products

GENERAL PRODUCTS DIVISION
HAYS MFG. CO.
ERIE, PA.

WATER SUPPLY AND SEWERAGE

This is the fourth edition of the well-known book by Prof. Steel. It has been brought up to date by addition of pertinent new material, while other material has been condensed or eliminated in order to retain the original length. New material on water includes evaporation control; rainmaking or rainfall control; use of plastic pipe; radioactivity of water; reservoir sanitation; desalting; softening; aeration; and flocculation. In sewage, special consideration is given to sewer construction; synthetic detergents; flotation in grease and sludge removal; trickling filter loadings; and activated sludge operation. In genera., the text is designed for engineering students and as a reference book to provide information to practicing engineers and plant operators. There are 635 pages and numerous illustrations. E. W. Steel, Professor of Civil Engineering, University of Texas. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. $11.

ENGINEERING HANDBOOK ON FANS

This bulletin on industrial fans contains some 17 pages of engineering data, including air volume tables, corrosion data and piping information. It covers performance from 270 to 48,000 cfm with static pressures from ½ to 18 ins. Bulletin IF-100. General Blower Co., Morton Grove, Ill.

REFUSE COLLECTION AND DISPOSAL

This is a report of a survey of refuse collection and disposal practices in 196 communities in Western Pennsylvania. It contains a summary statement and general description, by population categories of what is being done in refuse service to homes and commercial establishments. Data are given on collection frequencies, methods of collection, means of disposal and methods of financing. Other data include fee schedules, data on container size, ash collection and costs of collection and disposal as reported by some of the communities. A model refuse collection ordinance, prepared by the State Department of Health and the Public Health Service is included. The report contains 52 pages and is offset. $3 from the Institute of Local Government, 301 Bruce Hall, University of Pittsburgh, Pittsburgh 31, Pa.

DESIGN OF SMALL DAMS

This book has been published by the Bureau of Reclamation of the Department of the Interior as a guide to engineers, small water resource organizations and public agencies engaged or interested in the design and construction of small dams and retention reservoirs. In the introduction Commissioner F. L. Doming states that the book will provide engineers with information and data necessary for proper design; and it will simplify design procedures for small earth dams.

Only the more common types of small dams are discussed. These include concrete gravity, earthfill (rolled-type) and rock-fill dams. Emphasis is placed on the design of the common, rolled earth-fill type. Small dams are defined as earth and rock-fill structures with heights less than 50 feet above streambed, and concrete dams on pervious foundations whose "head" from headwater to tailwater does not exceed 20 feet.

In addition to discussions of the design of dams, spillways, and outlet works, the book contains chapters on project planning, flood studies, foundations and construction materials, diversion during construction, and maintenance and operation. Appendices are provided on hydraulic computations, construction of embankment, concrete in construction, sample specifications, and other supplementary features. There are 611 pages and 331 illustrations. Order from Supt. of Documents, Government Printing Office, Washington 25, D. C., or Bureau of Reclamation, Denver Federal Center, Denver, Colo., attention 841. Price is $6.50 postpaid.

WATER USE DATA COLLECTION

Fourteen Federal agency programs for collection of data on the uses of Water are listed in the publication "Federal Programs for Collection of Data on Water Use, Bulletin No. 10." The bulletin lists, by category of water use, schedules and scope of data collection pro-

(*Please turn to page 26*)

More work out of trucks ...at Lower Cost?

EATON 2-SPEED AXLES WILL DO IT!

On-the-job performance records prove that trucks equipped with Eaton 2-Speed Axles make quicker trips, travel more miles at lower cost per mile. By providing *double* the conventional number of gear ratios—the right gear ratio for every road and load—they reduce stress and wear on engine and power transmitting parts; permit engines to run efficiently under all operating conditions.

Eaton's exclusive features, including forced-flow lubrication, planetary gearing, and Inductalloy Axle Shafts, add thousands of miles to axle life, and eliminate costly maintenance expense worries.

Ask your dealer to explain how Eaton 2-Speed Axles reduce hauling costs, add to profits, and make trucks worth more on the trade-in.

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More than 2 Million Eaton Axles in Trucks Today

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MANUFACTURING COMPANY
CLEVELAND 10, OHIO

How to avoid a collision course Head-on collisions on our highways have become a national tragedy. To save hapless drivers from steering a collision course on the New Jersey Turnpike, the Turnpike Authority has erected some USS AmBridge Highway Beam Guard Rails and Posts along this heavily traveled route. ☐ Sturdy steel barriers, two feet high, will be centered along the grass strips which divide the turnpike's traffic lanes. The barrier rails are made

This mark tells you a product is made of modern, dependable Steel.

USS AmBridge Sectional Plate is perfect for drainage structures or underground passageways. It won't crack, won't break. It's easy to install because there's no need for forms. AmBridge Sectional Plate comes in a complete range of sizes.

USS AmBridge I-Beam-Lok is a sturdy, lightweight bridge flooring. It installs quickly and easily with few interruptions. The filled type is available in units 6' wide and up to 40' long that apply directly to stringers on spans from 6' up to 8' centers. The open type is also available for spans up to 4' centers.

of 10-gage steel plate bolted to spacers on 6″ WF, 8½-lb. steel posts 5′9″ long. These barriers are rugged. They'll put an effective stop to cars skidding across the grass into oncoming traffic. ☐ USS AmBridge Steel Beam Guard Rail is highly visible. It bolts easily but firmly to steel posts and is available in 12′6″ and 25′ lengths to minimize splicing. Write or contact any one of our offices for literature and information on American Bridge Highway Products.

USS, AmBridge and I-Beam-Lok are registered trademarks

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USS

1-
2-
3 steps
and
you
make
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tests
for
pH,
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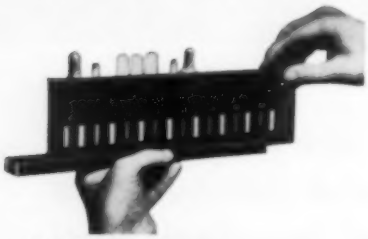
TAYLOR COMPARATORS



GUARANTEED NON-FADING COLOR STANDARDS

WRITE FOR FREE HANDBOOK
101 pages of technical data and useful information. Gives theory and application of pH control. Describes Taylor line.

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grams of the source agencies as well as the availability of data. Categories include rural domestic, public water supplies, agriculture, manufacturing and mineral industries, hydro and thermo power, navigation, pollution abatement, recreation, fish and wildlife and Federal installations. The work group responsible for publication was under the Chairmanship of G. W. Burke, Jr., Public Health Service. Members were from the Bureau of Mines, Forest Service, Agricultural Research Service, Geological Survey, Bureau of Reclamation, Department of Commerce, Soil Conservation Service, Tennessee Valley Authority and Corps of Engineers. The publication is for sale by the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at $.35 per copy.

KANSAS TRAFFIC ORDINANCE STANDARDS

According to an accompanying letter, this booklet presents the first standard or model traffic ordinance available and suitable for adoption by Kansas Cities. It is so arranged that it may be adopted in detail or incorporated in an ordinance by reference, with necessary changes to meet local conditions. It is the result of a long-term objective by the League of Kansas Municipalities, 112 West Seventh St., Topeka, Kans. It covers, among other things, traffic control devices, accidents, special offenses, speed regulation, driving rules, pedestrians, railroad crossings, stopping, standing, parking, lights, brakes, horns, drivers' licenses and vehicle tags. The price is indicated as $2.

CHARACTERISTICS OF ALASKAN SOILS

This bulletin is composed of six separate reports, representing four years of research on some Alaskan soils. The work, done for the Office of Naval Research, was carried on by the Iowa Engineering Experiment Station. Areas covered include the Matanuska Valley, the Big Delta and Fairbanks. Sections include a study of the trafficability of Alaskan Silts, of military trafficability of Matanuska Valley soils, mechanical stabilization of sediments near Point Barrow and use of crude oil for stabilization. There are 149 pages. Authors are D. T. Davidson, professor of Civil Engineering, C. J. Roy, Head of the Department of Geology and Associates, Bulletin No. 186, Iowa State University, Ames, Iowa. $3.

LOUISIANA WATER & SEWERAGE SHORT COURSE

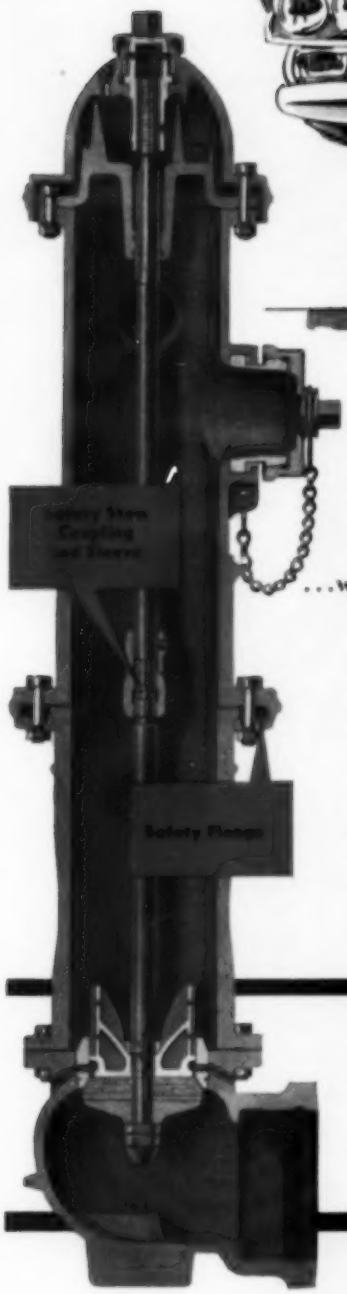
This bulletin contains 25 papers presented in March, 1959, at the 22nd Annual Short Course for superintendents and operators of water and sewerage systems. The papers cover such subjects as experimental studies on the hydraulics of backwashing filters; test wells and well measurement data; the chemistry of water; operation and maintenance of clarifiers; sewage plant odors; civil defense for water supplies; tastes and odors in water; cathodic protection; coagulation and sedimentation; and flow of water in pipes and channels. There are 170 pages. Ask for Bulletin No. 64, Engineering Experiment Station, Louisiana State University, Baton Rouge, La. $2.

INDUSTRIAL RENEWAL

This is a summary of a report which aims to develop a sound long-range plan for industrial redevelopment within the City of Philadelphia. The object of the study was to present the city's present industrial plant on the basis of an objective scale of obsolescence and to recommend a framework for a redevelopment plan, with priorities. The essential elements of obsolescence are identified and methods are suggested for measuring and evaluating the supply of industrial space and of estimating future demand. 123 pages. Philadelphia City Planning Commission, Philadelphia, Pa.

WATER QUALITY IN A PORTION OF CALIFORNIA

This report describes the geology and chemical quality of ground water in eastern Stanislaus and northern Merced counties, Calif. This work was done by the Department of Earth Sciences, Stanford Research Institute, Menlo Park, Calif., at Stanford University. The authors are Stanley N. Davis, Assistant Professor of Geology of the University and Francis R. Hall, geologist of the Institute. The research program in water, of which this report covers a portion, is directed mainly to the application of geology, hydrology and chemical quality of water to such problems as sea water intrusion, use of tracers, waste disposal and changes in chemical quality with time. This is Vol. 6, No. 1 of the Geological Sciences, Stanford University Publications, Stanford University, Stanford, Calif. 112 pages, with numerous maps and diagrams.



repair hydrant traffic damage

FAST

...without loss of water...without water shut-off...without digging

The Mueller AWWA Improved Fire Hydrant is quickly put back into action when knocked over.

Mueller's Safety Flange design prevents breakage of the hydrant barrel and bent or broken operating stem. Hydrant safety mechanism snaps off cleanly just above the ground line.

The compression-type main valve stays closed. No water is lost to affect pressure at neighboring hydrants. No damage is caused by flowing water. Lower stem section is held solidly in place to permit easy repair without digging.

The simple, inexpensive repair kit shown below contains all parts needed to completely restore hydrant to service in a matter of minutes.

Safety Flange Repair Kit

Consists of safety flange, safety stem coupling, safety flange gasket and can of Mueller hydrant lubricating oil.

Write for complete information and specifications.

MUELLER CO.

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Factories at: Decatur, Chattanooga, Los Angeles
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4303

WHEN CITIES PLAN INDUSTRIAL GROWTH

it pays to specify Vitrified Clay Pipe

SANTA PAULA, CALIFORNIA, already a bustling center of agricultural activity, is building to share in California's phenomenal industrial growth. To accommodate new industry and meet the needs of a growing population, Santa Paula recently completed a bond-financed sewer expansion project, using Vitrified Clay Pipe exclusively. Over 6 miles of Vitrified Clay Pipe were installed.

Like Santa Paula, growing communities everywhere need the permanence and safety that only Clay Pipe can provide. Clay Pipe is the only pipe that never wears out . . . does not rust, rot, corrode, or crumble. And with its new research-developed, factory-made joints, Clay Pipe is faster and easier to install than ever before.

When your community plans new sewerage facilities, be sure to consider the exceptional advantages of Clay Pipe. Its exclusive long-term guarantee is your assurance of permanent, maintenance-free service. Only Clay Pipe has *all* the features you can trust to handle industrial growth.

CITY OFFICIALS: James E. Leary, *Mayor;* Edwin C. Bixby, Ernest H. Oman, Ralph B. Crawford, Reece B. McCalister, Councilmen.
CONSULTING ENGINEERS: J. M. Montgomery Engineering Co. **CONTRACTOR:** N. P. Van Valkenburgh Co.

C-159-2A

Vitrified **CLAY PIPE** *Never Wears Out*

NATIONAL CLAY PIPE MANUFACTURERS, INC. 1820 N Street, N. W., Washington 6, D. C.
311 High Long Bldg., 5 E. Long St., Columbus 15, Ohio • 445 Ninth St., San Francisco 3, California • Box 172, Barrington, Illinois • 1401 Peachtree St., N.E., Atlanta 9, Georgia

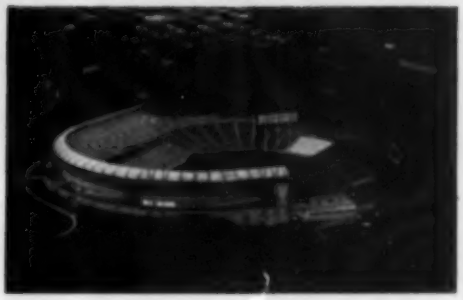
San Francisco
scores a homer with
Candlestick Park,
America's
newest
stadium

YOU CAN BE SURE...IF IT'S Westinghouse

America's newest baseball arena is lit at night for maximum "playability" with 1147 Westinghouse Type VRC-20 1500-watt floodlights. The precise aiming of the lights was under the direction of Westinghouse Lighting Sales Engineer Reed Hansen, *(below)*, and they are designed to burn at over-voltage increasing their normal candle power 37 percent. This means that players under most conditions enjoy visibility as good as daylight gives without the glare and shadows that frequently plague them on sunny afternoons.

Westinghouse floodlighting system maintains IES standards of intensity for playing areas. The striking design of the wind baffle tops massive concrete stadium. Two of the eight floodlighting towers that are spaced around perimeter of stadium are shown here.

J-94143-2



Giants' new home is Powered-Up for maximum nighttime "playability"

San Francisco's Giants racked up a 3 to 1 victory to open their season and inaugurate their new home in the West, Candlestick Park—one of the finest baseball stadiums in America.

Candlestick Park is a massive concrete structure that has an air of being weightless and soaring. Utilizing precast and prestressed beams and supports, the stadium consists of two tiers of seats (some radiant heated) that provide maximum "seeability" for 45,000 fans—with the upper deck topped by a unique wind baffle. To challenge the teams, foul lines extend 335 feet, and it's 420 feet straight from home plate to the fence. A giant scoreboard not only keeps tabs on the game in progress but also on action in both major leagues. A press, radio and loge-seat mezzanine, dressing rooms, refreshment areas and an 8700-car parking lot complete the impressive installation.

The careful attention applied to the architectural design and construction extends to the electrical distribution system serving the stadium. To give the field maximum "playability" at night, 1147 1500-watt Westinghouse floodlights make this one of the best-lighted baseball diamonds in the country. Included in the electrical system are eight power centers (one for each lighting tower), master lighting control panel, individual lighting panelboards, dry-type transformer, motor

(cont.)

YOU CAN BE SURE...IF IT'S Westinghouse

J-94143-2

Checking scale model of Candlestick Park are Lyle E. Patton, Consulting Electrical Engineer; John S. Bolles, Architect; Walter A. Haas, President of the San Francisco Recreation and Park Commission; and Raymond S. Kimbell, General Manager of the San Francisco Park Department.

Economical power distribution for Candlestick Park was achieved with eight Westinghouse unitized power centers of 750- to 225-kva ratings, each having plenty of expansion room. Each power center steps 12-kva primary power down to 120/208 volts to serve lights and electrical equipment. Inspecting one center: M. P. Buswell, Westinghouse Area Sales Manager; C. L. Harney, General Contractor; and L. E. Patton.

Motor control and protection are afforded by the Westinghouse motor control center under examination by H. G. Dechene of Brayer Electric; L. E. Patton; and D. G. Hartman, Westinghouse Sales Engineer. Such control centers group all controls together in interchangeable, space-saving, easily installed modular units. Starter units control and protect motors for air distribution units from centralized location.

Lighting for concourse and corridors is controlled and protected by Type NLAB panelboards located around stadium. Relays and control switches installed in this panel allow remote operation from centralized point. Seen examining this attractive flush mounted panelboard in stadium concourse are H. G. Dechene and G. R. Brayer of Brayer Electric Co.; and Spence Pors, Westinghouse Distributor Salesman.

Comfortable heating for Giants' locker room and clubhouse area is provided by Type AH horizontal air distribution unit, one of four in Candlestick Park. The inherent design of stadium construction, with widely separated points of heating demand, is an excellent application of Sturtevant air handling equipment.

Giants' new home *(cont.)*

control center, air handling equipment and motors. All are Westinghouse products, chosen for their ability to provide dependable, uninterrupted service. Careful attention to future uses for the stadium produced an electrical system capable of expansion. For example, the field lighting and related power supply equipment can be easily enlarged to provide the extra illumination required for nighttime football games. For information about how the Westinghouse products that Powered-Up Candlestick Park can meet your electrical needs, call your nearby Westinghouse Electrical Construction Engineer. Or write, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania.

OWNER: San Francisco Stadium Inc., for City and County of San Francisco
ARCHITECT-ENGINEER: John S. Bolles, San Francisco
E. Elmore Hutchison, San Francisco
CONSULTING ELECTRICAL ENGINEER: Lyle E. Patton, San Francisco
GENERAL CONTRACTOR: Chas. L. Harney, Inc., San Francisco
ELECTRICAL CONTRACTOR: Brayer Electric Co., San Francisco
WESTINGHOUSE DISTRIBUTOR: Westinghouse Electric Supply Co., San Francisco

J-94143-4

YOU CAN BE SURE...IF IT'S Westinghouse

Tough, durable Micarta® is ideal surfacing for Candlestick Park's refreshment counters. This hard-working plastic surface is immune to scuffs, knocks, hot liquids and rough treatment . . . is easily cleaned, never needs refinishing. Shown are Tom Morse, U. S. Plywood Salesman; Joe M. Moore, Cabinetmaker; and Bill Lyle, Westinghouse Micarta Salesman, examining Micarta counter top.

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NEW LISTINGS

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Cut Crime and Accidents

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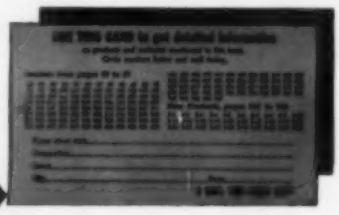

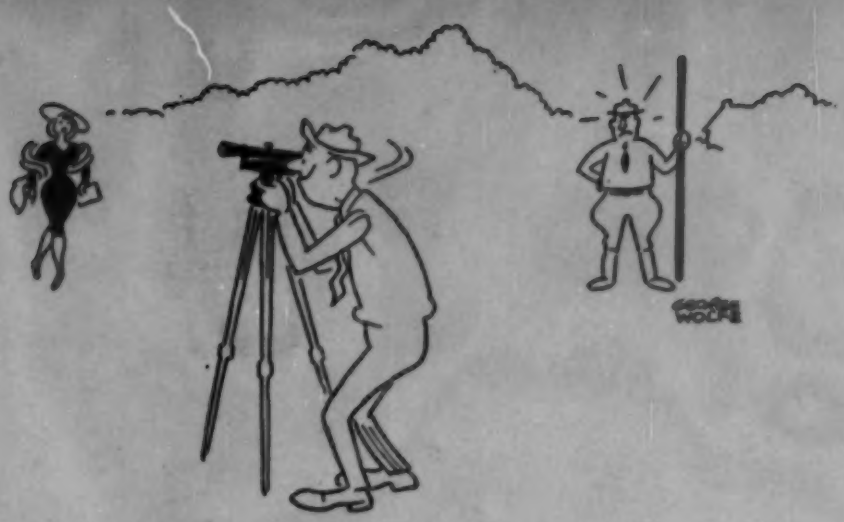

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South Dakota Water and Sewage Works Conference
Grand Hotel, Watertown, So. Dak., Sept. 7-9. Sec.-Treas., Don C. Kalda, State Dept. of Health, Pierre, So. Dak.

Georgia Water & Sewage Assn.
Sewage & Industrial Wastes Section, Georgia Institute of Tech., Atlanta, Ga., Sept. 7-9. Sec.-Treas., Robert S. Ingols, Georgia Institute of Tech., Atlanta, Ga.

Institute of Traffic Engineers
Edgewater Beach Hotel, Chicago, Ill., Sept. 12-15. Exec. Sec., David M. Baldwin, 2029 K St., N. W., Washington 6, D. C.

American Water Works Assn.
Kentucky-Tennessee Section, Andrew Johnson Hotel, Knoxville, Tenn., Sept. 12-14. Sec., Harold F. Mount, Gen. Mgr., Preston Street Road Water Dist. No. 1, 5400 Preston Hwy., Louisville, Ky.

Kentucky-Tennessee Industrial Wastes and Sewage Works Assn.
Andrew Jackson Hotel, Knoxville, Tenn., Sept. 12-14. Sec.-Treas., S. Leary Jones, 602 Cordell Hull Building, Nashville, Tenn.

American Water Works Assn.
New York Section, Saranac Inn, Saranac Inn, N. Y., Sept. 14-16. Sec.-Treas., Kimball Blanchard, c/o Neptune Meter Co., 22-22 Jackson Ave., Long Island City, N. Y.

American Water Works Assn.
Virginia Section, Cavalier Hotel, Virginia Beach, Va., Sept. 14-16. Sec., Edward H. Ruehl, c/o R. Stuart Royer & Assoc., 15 W. Cary St., Richmond, Va.

New England Water Works Assn.
Annual meeting, Queen Elizabeth Hotel, Montreal, Canada, Sept. 18-22. Sec., Joseph C. Knox, 73 Tremont St., Boston 8, Mass.

National Conference for County Engineers and Officials
Annual Meeting, Biltmore Hotel, Atlanta, Ga., Sept. 19-21. Dir., Ben F. Ostergren, County Div., ARBA, 600 World Center Bldg., Washington 6, D. C.

American Water Works Assn.
Michigan Section, Park Place Hotel, Traverse City, Mich., Sept. 21-23. Sec., T. L. Vander-Velde, Chief, Section of Water Supply, State Dept. of Health, DeWitt Rd., Lansing, Mich.

American Water Works Assn.
North Central Section, Lowry Hotel, St. Paul, Minn., Sept. 21-23. Exec. Sec., Carl A. Flack, Water Dept., 216 City Hall, St. Paul 2, Minn.

American Water Works Assn.
Missouri Section, Governor Hotel, Jefferson City, Mo., Sept. 25-27. Sec., Warren A. Kramer, Chief, Water Supply, Div. of Health, State Office Bldg., Jefferson City, Mo.

Missouri Sewage and Industrial Wastes, Assn.
Governor Hotel, Jefferson City, Mo., Sept. 25-27. Sec.-Treas., Jack K. Smith, Water Pollution Control Bd., Old P. O. Bldg., Jefferson City, Mo.

American Water Works Assn.
Wisconsin Section, Loraine Hotel, Madison, Wis., Sept. 28-30. Sec., Harry Breimeister, Bureau Engineers, 607 Municipal Bldg., Milwaukee, Wis.

American Public Health Assn.
Civic Auditorium, San Francisco, Calif., Oct. 31-Nov. 4. Exec. Dir., Dr. Berwyn F. Mattison, 1790 Broadway, N. Y. 19, N. Y.

American Assn. of State Highway Officials
1960 Convention, Nov. 27-Dec. 2, Detroit, Mich. Write: A. E. Johnson, 917 National Press Bldg., Washington 4, D. C.

American Road Builders' Assn.
Chalfonte-Haddon Hall, Atlantic City, N. J., Mar. 5-8, 1961. Vice Pres., Louis W. Prentiss, 600 World Center Bldg., Washington 6, D. C.

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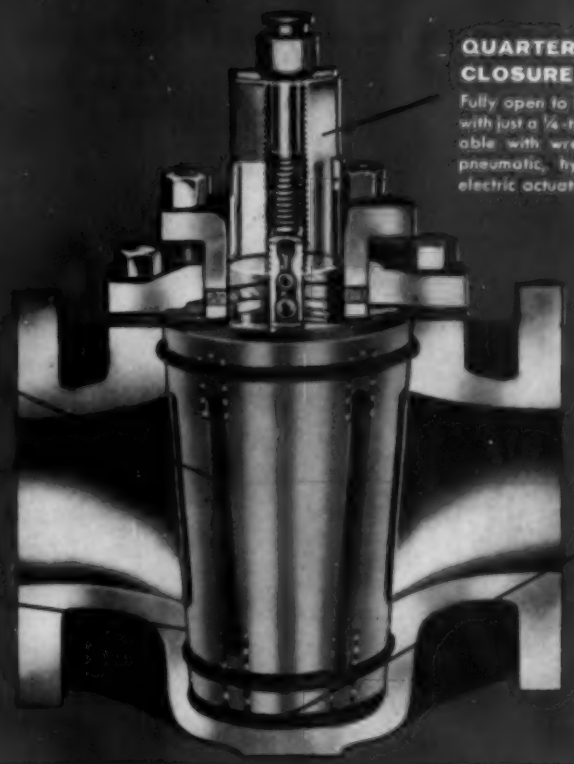

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472. Get data on the new "Rollgate" hydraulically driven roll-type spreader that applies uniform amounts of salt, sand, cinders or other materials up to 1 inch diameter over an 8-ft. width. Write Good Roads Machinery Corp., Minerva, Ohio, or check the inquiry card.

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No weather problems this winter —if you plan now...

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Worker guides an oval-shaped section of Inner Circles pipe which the Tunnelugger has carried through the conduit already laid.

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WATER WORKS

Wherever Water Flows, Steel Pipes It Best

26. Brochures covering steel Pipe meeting the essential requirements for a water pipe line are available from Steel Plate Fabricators Association, 105 West Madison St., Chicago 2, Ill. Check the reply card today.

Do You Have An Independent Source of Electricity?

27. An independent source of electricity which will supply power for vital services when regular sources fail can be invaluable during emergencies. Check Kohler Bulletin KEP 56-1 which furnishes data that will help you select the plant best suited for your needs. Many models, 500 watt to 50 Kw, portable and stationary are described. Write the Kohler Co., Kohler, Wis., or use the reply card.

Ball and Socket River Crossing Cast Iron Pipe

33. Literature is available describing Clow ball and socket cast iron pipe for river crossing, or any installation where full 15 degree free turning deflection is desirable. For description and specifications, address James B. Clow & Sons, Inc., P. O. Box 6600-A, Chicago 80, Ill.

Propeller Meters For Dependable Water Metering Control

53. The complete line of Measure-Rite propeller meters are described in Bulletin MR-105 available from Measure-Rite, Inc., 4545 W. Brown Deer Rd., Milwaukee 23, Wis. Check the card for details on these accurate meters.

How to Select Right Angle Drives

62. Data-filled Catalog 31 of Johnson Gear & Mfg. Co., Ltd., 8th & Parker Sts., Berkeley 10, Calif., makes it easy to select the correct right-angle gear drive for deep well turbine and other vertical shaft pumps. Includes details on the Johnson "Redi-Torq" gear drive. To get your copy just check the reply card.

Catalog on Synchronous Motors and Controls

64. A 27-page Catalog B-7292 on synchronous motors and controls is well illustrated and contains motor selector charts, application data, and formulas for calculating power factor. For a copy write Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa., or check the reply card.

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, and is available from Reed Mfg. Co., Erie, Pa. Check the reply card.

Efficient Coagulation With Ferri-Floc

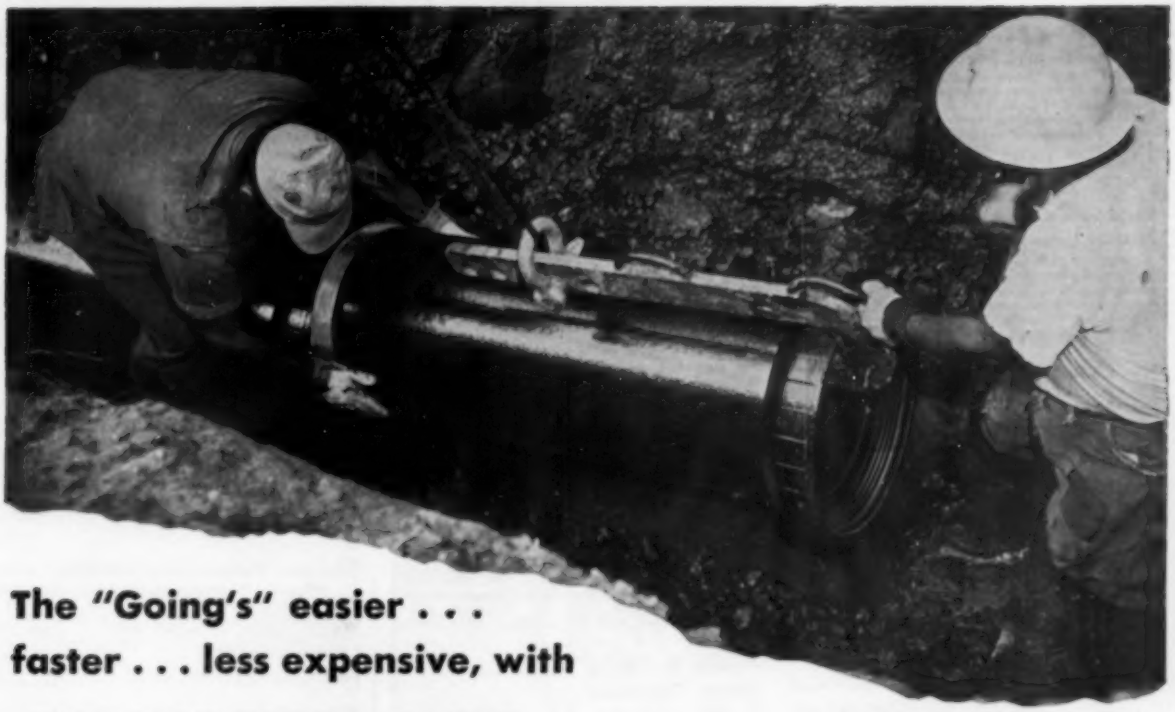
69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal control of certain tastes and odors plus other aids in high quality water production. Check reply card for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

100 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH, Chlorine and Phosphate Control and descriptions of comparators for making colorimetric analyses. A 100 page booklet is available by checking reply card. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

Manual on Instrument Accessories and Supplies

96. The 60-page loose-leaf book, Catalog 500, includes specifications, part numbers and prices for more than 250 commonly furnished instrument parts and supplies. It is divided into 5 sections: Mechanical; pneumatic; electric-electronic, general, and tools and service. Check the reply card or write The Foxboro Co., Foxboro, Mass., for your copy.



The "Going's" easier . . .
faster . . . less expensive, with

UNIVERSAL *Flexible-Coupled* VITRIFIED CLAY PIPE

OWNER: City of Tallmadge Board of Education, Tallmadge, Ohio

ARCHITECT: Beiswenger, Hoch, Glaus & Verbeck, Akron, Ohio

ENGINEER: E. D. Barstow, Consulting Engineer, Akron, Ohio

CONTRACTOR: L. & B. Construction Co., Akron, Ohio

PIPE: 15" Universal Vitrified Clay Pipe with Pre-assembled Tylox Rubber Couplings.

This view of a Tallmadge, Ohio sewer job in progress clearly shows how Universal Vitrified Clay Pipe and Tylox rubber couplings "join up" to combat tough trench conditions and make line installation easier, faster, and therefore less expensive. The Joint is pre-assembled to pipe at the factory, ready for immediate installation upon arrival at Job Site. Multiple-ring *compression* gaskets seal instantly and automatically, as pipe is coupled. There's no "wet ditch" delay . . . the pipe can be coupled in water or *under* water.

These are main reasons why engineers and contractors in the area we serve rely on Universal Vitrified Clay Pipe with Pre-assembled Flexible Couplings to assure tightly coupled sewer lines installed at lower cost. Arrange with us for this unbeatable pipe and joint combination on *your* projects.

TEN UNIVERSAL — U.S. PLANTS AND YARDS ARE ALERT TO SERVE YOU

6097

UNIVERSAL SEWER PIPE DIVISION

UNITED STATES CONCRETE PIPE CO.

A Subsidiary of Pittsburgh Coke and Chemical Company

SALES OFFICES:

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Philadelphia, Pa. (Mail—Bristol, Pa.)	Tel. EN-6015	Ft. Lauderdale, Fla., Box 958	Tel. LU-3-7220
Bristol, Pa., Box 30	Tel. ST-8-5571	Kalamazoo, Michigan	Tel. DA-7-3016
		Oakdale, Pa., Box 126	Tel. OW-3-9403

GENERAL OFFICES • 1500 Union Commerce Bldg. • Cleveland 14, Ohio • Tel. MAIN 1-5240

To order these helpful booklets check the reply card opposite page 34.

Before Taking Bids on Water Storage Tanks . . .

104. Learn more about GATX tanks, designed and fabricated by one of the nation's largest steel fabricators in accordance with AWWA specifications and municipal requirements. For detailed information, address Plate and Welding Div., General American Transportation Co., 135 So. La Salle St., Chicago 90, Ill., or circle our card number.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

When You Need Water Stops

129. Have all the facts as contained in free 43-page book MRG 622 of the Gates Rubber Co., 999 So. Broadway, Denver, Colo. Ask them for it, or we will get it for you if you circle their number on card herein.

Controlling Water in Masonry

135. . . . confronts and puzzles practically every building owner, designer or builder. There is still no "wonder drug" cure-all, but a very valuable 44-page booklet is available that goes farther in diagnosis and suggested remedies than anything we have yet seen. Your copy of "Walls Breathe" can be had from Western Waterproofing Co., 1223 Syndicate Trust Bldg., St. Louis 1, Mo. Or if you check our card number it will be sent you.

A Handy List on "In Stock" Pipe

148. . . . is issued monthly by L. B. Foster Co. to show all stock footages of seamless and welded pipe, structural steel pipe and other specialties. Enables you to order pipe with exact knowledge of what is immediately available. Address L. B. Foster Co., P. O. Box 1647, Pittsburgh 30, Pa., or you can just check number on our card.

The Submersible Pump You have Been Waiting For

141. Electric, fully submersible, portable, runs dry without damage, no priming, and other outstanding advantages. All are described in Flygt Bulletin B-80L of Flygt Corp., Hoosick Falls, N. Y. Address them or just circle the number on our card.

AWWA Fire Hydrants and Gate Valves

133. Above-ground maintenance Mueller AWWA improved fire hydrants and minimum maintenance Mueller AWWA non-rising stem gate valves are described in literature from Mueller Co., Decatur, Ill.

There's Far More Than Meets the Eye in Cyclone Fence

168. Get the full story of all that this fencing is and what it can do for you around expressways, reservoirs, sewage works, pumping plants, incinerators, landfills, recreation areas, storage yards and the many other places where public works need protection. Address Cyclone Fence, American Steel & Wire, 614 Superior Ave., N.W., Cleveland 13, Ohio; or circle the number on this card.

Engineering Data On Mechanical Joint C.I. Pipe

183. General specification, weights and dimensions of mechanical joint cast iron pipe and fittings are furnished in a 32-page booklet issued by Alabama Pipe Co., Anniston, Ala. Get this helpful data by checking reply card.

Manual on Pipe Finding Techniques

213. A manual on special pipe finding and leak detecting techniques of interest to utilities, municipalities, oil and gas companies is announced by Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif. The manual contains a number of articles on locating buried pipes and cables and detecting and locating fluid leaks in pipe lines.

Manual on Filter Bed Agitators

206. General information-specifications and installation data regarding the application of Palmer agitators, or rotary surface wash in vertical and horizontal pressure filters—round, square and rectangular open gravity type filters are covered in Manual from Palmer Filter Equipment Co., 822 East 8th St., P. O. Box 1070, Erie, Penna. Check the reply card.

Meters and Instruments For Water Works

234. An attractively arranged 40 page catalog in full color issued by Hersey-Sparling Meter Co., 225 No. Temple City Blvd., El Monte, Calif., furnishes concise data on the full line of Sparling meters, indicator-totalizer-recorder instruments and other special instruments and controls. Check the reply card for your copy, or write for Bulletin 314.

A Quick Comparison of Water Meters Helps

274. That is the purpose of the new bulletin describing the newest accomplishments in water meter design and manufacture. With it comes a Condensed Catalog of the Rockwell line. Ask for Bulletin No. W-811 from Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa., or check the card.

Who Says Water Tanks Stand Still?

278. Not in design they don't. For the latest developments in Horton steel reservoirs and standpipes it is time now to write for new bulletin, liberally illustrated and with table of standard tank dimensions, to Chicago Bridge & Iron Co., 332 South Michigan Ave., Chicago 4, Ill., or check the card number.

A New Note in Waterworks Brass Goods

492. The Hays line covers everything from curb stops to tapping machines. Beautifully illustrated catalog is packed with information to help you buy the best. To get your copy write Hays Mfg. Co., Erie, Pa., or check the card.

KOEHRING

Will your loader investment dollars depreciate or compound interest?

VERSATILE SKOOPER BREAKS ALL COST BARRIERS IN HIGH PRODUCTION LOADING

There's nothing like it— on wheels or tracks!

Skooper has enabled many a road, street and highway department to increase loading capacity while cutting maintenance and downtime to the bone. It has a 7′ hydraulic crowd to load the bucket without using any tractive effort. With a Skooper there's no flying starts, no burning tires, no churning crawlers. Result: lower maintenance . . . less fuel does more work. Highest production at lowest possible cost.

The Skooper's 7′ crowd, combined with a full 360° swing, enables it to load up to 400 tons per hour, while standing still. There's nothing like it on wheels or tracks. And you can convert Skooper to hoe, dragline or crane at any time.

For the best in loading, Skooper gives you more work capacity per dollar invested . . . bonus tonnage with less maintenance. See your Koehring distributor soon. K3

KOEHRING
DIVISION OF KOEHRING COMPANY
Milwaukee 16, Wisconsin

To order these helpful booklets check the reply card opposite page 34.

Compact Trencher Thrives On City Work

246. Problem trenching locations in city and surburban work where obstructions prevail are neatly solved by the Cleveland Model 92 "Baby Digger," a small, compact, tough trencher. Full description, specifications and many photos in Bulletin L-108 give the full story. Write Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Do You Know the Value of the V-Notch?

293. A new booklet tells what you want to know about how chlorine feeding can be made as regular and precise as the sunrise. Ask for "The V-Notch Story" direct of Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J., or check the card-number.

There's More than One Way to Dig a Trench

318. Arps Corporation lets you choose. The ARPS tractor-mounted Trench Hog makes it cheaper, better to own your own trencher. Digs to 7 foot deep, 20" wide. Trench-Devil M-A has 7 appealing new features. Smaller Trench-Devil Jr. keeps you from sending a man to do a boy's work. Write Arps Corp., New Holstein, Wis. or check the card for bulletins.

American Ductile Iron for Pipe, Tubing, Casing and Fittings

463. A 36-page illustrated catalog that describes the complete line of American Ductile iron products is available from American Cast Iron Pipe Co., P. O. Box 2603, Birmingham 2, Ala. Check the reply card for technical data including grades, specifications, dimensions and

Halve Your Time on Pipe Pushing and Pulling

517. Continuous-motion machine works all the time to keep pipe moving fast until it is through. Hand or air powered. Write for new folder to The Trojan Mfg. Co., 1112 Race Drive, Troy, Ohio, or use our reply card.

To Meet Increasing Water Demands, These Two Steps Will Help

247. Two new products designed to help meet constantly increasing demands for water are described in a folder of Hersey-Sparling Meter Co., 250 Elm St., Deham, Mass. These are a flow analyzer that provides strip chart rate of flow and volume records, and a two-rate register that can be substituted for the flow analyzer. Get this data by checking our reply card.

Data on Adjustable-Speed Magnetic Drives for Low-Lift Pumps

465. A catalog is available from Electric Machinery Mfg. Co., Minneapolis 13, Minn. that tells all about E-M Vertical Synchronous Motors and Magnetic Drive Units. Engineers check the reply card for information on this equipment for sewage pumps.

Use The Reply Card

Streamlined and Modernized Fire Hydrants

467. Models, dimensions and advantages of the Eddy fire hydrant are covered in bulletin from the Eddy Valve Co., Waterford, N. Y. Check the reply card for complete details.

Handbook on How to Lay Concrete Pressure Pipe

524. Manual on concrete pipe laying instructions is available from Price Brothers Co., Dayton, Ohio. Check the reply card for information on how to dig the trench and handle the pipe, make the joint and the pipe bedding procedure.

Bitumastic For Lasting Protection Against Corrosion

570. Bitumastic protective coatings prevent corrosion of metal and deterioration of concrete and masonry and are fully covered in catalog from Koppers Co., Inc., Tar Products Div., Pittsburgh 19, Pa.

Diesel Engines For Municipal Power Needs

359. Dependable power for water supply or flood control pumping stations, stationary or portable electric plants and many other municipal needs can be provided by engines described in literature of the Enterprise Engine & Machinery Co., 18th & Florida Sts., San Francisco 10, Calif.

Badger Read-o-Matic Register For Outside Water Meter Reading

536. The Read-o-Matic is simple to install and requires no outside power. Doorbell-type wire carries the pulse from generator in meter to the register on the outside of the building. Check the reply card or write Badger Meter Mfg. Co. 4545 West Brown Deer Road, Milwaukee 23, Wisc.

Manual on Valves, Fire Hydrants and Accessories

559. A 244-page manual covering Darling valves and fire hydrants in a broad range of types, sizes and constructions is available from Darling Valve & Mfg. Co., Williamsport, Pa. Engineering data, application tips, valve accessories information, reference data on materials, specifications and standards are covered.

Play Safe with Automatic Controls

603. Remote engine and pumping controls of every sort are fully described in a series of bulletins offered by Synchro-Start Products Inc., 8151 N. Ridgeway Ave., Skokie, Ill. Write them or circle the above number on our card.

Turn Your Water Meter Reading Inside-Out

677. The Visi-Meter is a remote recording and indicator system that eliminates the need of entering the home to read water meters. It records within an accuracy of 0.1 percent. Check the reply card or write Visi-Meter, Inc., 301 North 17th St., Kansas City, Kans., for literature.

To order these helpful booklets check the reply card opposite page 34.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

30. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 208 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

You Don't Need a Big Plant to Get Big Savings

21. . . . in mechanical sludge dewatering. Now the smaller plant can cut power costs, eliminate use of chemicals and reduce labor. 4-page bulletin on the "Roto-Plug" sewage sludge concentrator shows how this is accomplished. Write for Bulletin 100 to Nichols Engineering & Research Corp., 60 Pine St., New York 5, N. Y., or check the card-number

Equipment For Water, Sewage and Industrial Waste Treatment

24. The complete line of Jeffrey equipment for treatment plants is covered in a 64-page Catalog 952 available from The Jeffrey Mfg. Co., Columbus 16, Ohio. Check the reply card for information on bar and disc type screens, traveling water screens, grinders, grit collectors, garbage grinders, sludge, draw-off valves, chemical feeders, bucket elevators and scum removers to mention some of the equipment.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers.

Protective Lining for Concrete Pipe and Structures

131. T-Lock Amer-Plate is a tough, long-lasting acid-resistant vinyl sheet lining for concrete pipe and structures which are exposed to corrosive materials. T-shaped ribs pressed in the sheet are embedded in the concrete as it is poured to lock the lining permanently in place. Get full details from Amercoat Corp., South Gate, Calif., or check the reply card for illustrated folder.

Elliptical Concrete Pipe for Sewers and Culverts

143. A 4-page bulletin is available from United States Concrete Pipe Co., 1500 Union Commerce Bldg., Cleveland 14, Ohio, on the use of elliptical pipe to obtain round pipe flow equivalents in certain areas. Check the reply card for diagrams, data charts and tables that fully describe elliptical pipe sizes and compute discharge flow rates for the full range of pipe sizes.

Transite Pipe For Sewer Mains

166. Johns-Manville "Transite" Sewer Pipe, made of asbestos-cement, is available in 11 different diameters ranging from 6" to 36" and in five new crushing strengths to permit greater efficiency in system design. "Ring-Tite" Coupling, designed for high-speed assembly, provides tight, long-lasting seal. Easy-to-assemble Transite sewer fittings also furnished. For complete information, write for brochure TR-165A (Transite Sewer Pipe), TR-94A (Sewer Design Flow Chart), and DS-366 (Transite Material Specification). Johns-Manville, 22 East 40th St., New York 16, N.Y. Check reply card.

Dependable Engines for Sewage Treatment Plants

227. Climax Sewage Gas Engines are available for continuous duty operation to drive pumps, blowers or generators in a range of sizes from 40 to 250 HP. Use the handy reply card to obtain complete details and literature from Climax Division, Waukesha Motor Co., Box 379, Waukesha, Wisc.

How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass. Check the reply card.

Handy Reference on Centrifugal Pumps

115. Basic pump models, closed or open impeller and self priming solids handling series with models up to 8" size are presented in Form 9-1P-11 of Gorman-Rupp Co., 305 Bowman St., Mansfield, Ohio. Performance curves and lists of features make this a useful reference. For yours, check the inquiry card.

Vitrified Clay Pipe That Joints Like Magic

171. Clay pipe with new "Presto-Seal" joints have spigot and socket ends of factory-moulded polyester, with a permanently embedded rubber compression gasket, a combination that gives a permanent, flexible seal in seconds. For illustrated literature on joint details, installation and performance get Bulletin PS-101 from Kaul Clay Company, P. O. Box 628, Toronto, Ohio.

How Are Your Bridge Floors?

185. If you face replacements—or plan new bridges—you will find much really helpful data on steel mesh bridge flooring, safety features, tractional surfaces, dimensions, weights, loads and spans in a new booklet offered by Irving Subway Grating Co., Inc., 30-09 27th St., Long Island City 1, N. Y. Includes detail drawings, specifications, also data on bridge sidewalks. Write for "Irvico Decking" booklet today.

Data Book For Engineers

199. New Link-Belt Catalog (No. 2617) includes all recent additions to their Water, Sewage and Industrial Waste treatment equipment. All designing engineers will want this one. Write Link-Belt Co., Colmar, Pa., or use the card.

SPEED SENSITIVE

1, 2 & 3 ELEMENT
SWITCHES

OVERSPEED
One S. P. D. T. switch to trip at speeds between 300 and 6,000 RPM.

OVER AND UNDERSPEEDS
Two S.P.D.T. switches to trip at two different speeds between 300 and 6,000 RPM.

UNDERSPEED
One S. P. D. T. switch to trip at speeds as low as 250 RPM. Maximum operating speed 5,000 RPM.

OVER INTERMEDIATE AND UNDERSPEED
Three S.P.D.T. switches to trip at three different speeds between 350 and 6,000 RPM.

EXPLOSION PROOF AVAILABLE
The switches listed above are available with explosion proof containers that meet all of the specifications of Class 1, Group D, explosion proof equipment.

For further information ask for Bulletin 504 and 504 A.

SYNCHRO-START PRODUCTS, INC.
8151 N. RIDGEWAY AVE., SKOKIE, ILL.

Good Roads MACHINERY

TG-500
"ROLLGATE"
All-weather Spreader

All new... low-cost Rollgate Spreader delivers big results!

The all new "Rollgate" is a hydraulically driven roll type spreader, designed to fasten to any standard 7½ or 8 foot wide dump truck body. It is one man operated and provides an even flow of materials over the 8 foot width of the spreader. Spreads salt from 75 lbs. per mile to any desired amount or from feather edge to 3" depths when seal-coating.

Hydraulic adjustment provides the most efficient and economical control for spreading sand, salt, cinders, gravel, slag or other materials up to one inch in diameter. The "Rollgate's" speed, versatility, simplicity, and low original cost enables cities, villages and townships to utilize one piece of equipment for spreading operations in all seasons.

For complete details see your local distributor, or write to:

Good Roads MACHINERY
GOOD ROADS MACHINERY Corp.
MINERVA, OHIO

To order these helpful booklets check the reply card opposite page 34.

"Work Horse" Power via Wisconsin Engines

233. 3 to 56 hp. heavy duty air cooled engines, ready to go to work when you get them, are described in Bulletin S-249. This bulletin covers power and weight specifications, dimensions and installation data for the entire line. Write Wisconsin Motor Corp., Milwaukee 46, Wisc. direct, or check our card.

68-Page Sewer and Culvert Pipe Catalog

310. . . . contains nine sections of the latest engineering information on machine-made roller, suspension, cast, special, reinforced concrete pressure and reinforced concrete subaqueous pipe. Organized for quick reference regarding construction, applications and sizes. A real gold mine of pipe line information. Address Lock Joint Pipe Co., Box 269, East Orange, N. J., or check the number above.

Sludge Disposal by Incineration

314. . . . is the subject of an informative brochure put out by a leader in the field. Both public works engineers and lay officials will find it lucid in style, enlightening in the presentation, well illustrated. For your copy write Nichols Engineering and Research Corp., 80 Pine St., New York 5, N. Y., or circle our card-number here.

Renew Pipe Performance With Cement Mortar Lining

322. Application of the Tate and Spunline process for cement mortar lining of existing pipe lines with a minimum of interruption of service is described, with diagrams, photographs and specifications in Catalog 13-58. Write to Pipe Linings, Div. of American Pipe and Construction Co., P. O. Box 457, Wilmington, Calif.

Clean Sewers Cost Less Than New Ones

554. Here is news on 1960-models sewer-cleaning equipment that can keep money in your municipal pocket. To get latest literature on the O'Brien line just write O'Brien Manufacturing Corp., 5632 Northwest Highway, Chicago 46, or check the card.

Use The Reply Card

Weinman Horizontal Non-Clog Centrifugal Pumps

579. Non-clog pumps for sewage and sludge in municipal plants are covered in literature from the Weinman Pump Mfg. Co., 290 Spruce St., Columbus 8, O. Specifications and dimensions are included.

Equipment For Sewage Disposal Plants

585. Sewage gas meters, gas regulators, lubricated plug valves and water meters are described in Bulletin C-5200-3, available from Rockwell Mfg. Co., Meter and Valve Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.

Sludge Removers for Tanks of Any Size or Type

659. The Rex Unitube Tow-Bro Sludge Remover is described as a proven standard of the industry. Bulletin 315-81 shows how Tow Bro can be applied to tanks of any size or type. Write Chain Belt Co., Milwaukee 1, Wis.

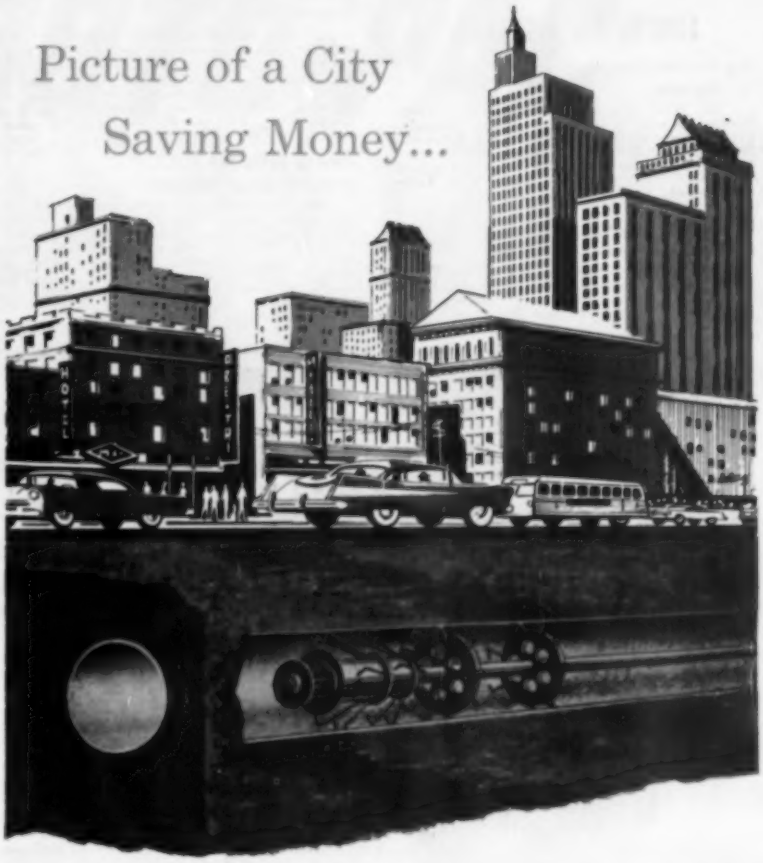
Catalog on Steel Grating

665. New ideas in flooring, walkways, stair treads, platforms and shelving are covered in Catalog 2527R available from Blaw-Knox Co., Dept. W., Pittsburgh 38, Pa. Check the reply card for information on choice of cross bar and bearing bar designs and spacings.

Full Line of Sewer Cleaning Equipment

681. Everything for rodding sewers from hand operated equipment to the fully mechanized SeweRodeR. Tools for all types of stoppages are operated by Flexicrome Steel Sewer Rods. Featuring the Truck-Loder which dumps sewer deposits directly into truck, a complete range of Bucket Machines is offered. All equipment is described in 48-page Catalog 59-A. Flexible, Inc., 3786 Durango Ave., Los Angeles 34, Calif.

Picture of a City Saving Money...



Spunline Relines Pipe Lines In-place without removing the pipe

Another city such as Spokane, Dallas, or Los Angeles will soon be enjoying the savings of another rehabilitated pipe line. The flow will increase, the pumping cost will drop and the pipe line will be good as new for at least another quarter of a century.

And traffic will move without interruption or inconvenience to the public.

Spunline® is applicable to pipe lines down to 4" and may be used in cast iron, steel, concrete and wrought iron pipe lines.

Write, wire or phone **PIPE LININGS Inc.**

Subsidiary of American Pipe and Construction Co.

2414 East 223rd Street, Wilmington, California
P.O. Box 457 • Phones: SPruce 5-3273 — TErminal 5-8201
Rail Address, Pacific Electric, Watson, California

To order these helpful booklets check the reply card opposite page 34.

STREETS AND HIGHWAYS

Big Tractor Shovels for Big Jobs

93. New 4 color bulletin describes two largest capacity "Michigan" tractor shovels. Gives specifications, illustrations and suggested applications that make these big machines pay. Write for Bulletin TS2500 to Construction Machinery Div., Clark Equipment Co., Pipestone Plant, Benton Harbor, Mich.

Data on Portable Hydraulic Earth Borer

138. Complete specifications on the Holan hydraulic earth borer are available from J. H. Holan Corp., 4100 West 150th St., Cleveland 11, Ohio. Check the reply card for literature.

Seven New Models of Tractor Shovels

117. To deliver maximum production combined with fast, economical operation two new models have been announced. Each has three interchangeable buckets and the famous Trojan Safety Curve Lift Arms. Ask for specification bulletins from The Yale & Towne Mfg. Co., Trojan Div., Batavia, N. Y., or circle their number on the card.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem reduce troublesome brush and trimmings to tiny, easy to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16 page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass.

Budget Call for MORE Tractor --- at LESS Cost?

SPEEDEX

SPEEDEX Tractor Co., Ravenna, Ohio

SPEEDEX is your perfect answer! The big 9 h.p. SPEEDEX Tractor, Model S-23, shown at left, compares favorably in performance and power with nationally-known farm tractors—at half the price! Briggs & Stratton engine, 2 power ranges, ¼ to 10 m.p.h., geared reduction steering wheel, 7" x 16" tires, easy lift tool lever, TIMKEN bearing transmission—these are just a few of its features. This is the latest improved model of SPEEDEX Tractors that have given outstanding service since 1935—far better now than ever before.

Model S-23
9 hp $475. list

MANY YEARS OF TROUBLE-FREE SERVICE

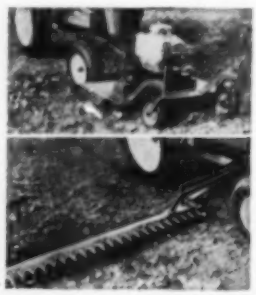
SPEEDEX owners constantly tell of complete freedom from breakage troubles. Many report twenty years use without a single repair! There's a good reason—every SPEEDEX is BUILT TO LAST—every part is made many times stronger than it will ever need to be. You can depend on SPEEDEX—proven by our full year guarantee.

CHOOSE FROM 5 MOWERS

Shown (lower right) Sickle Bar (30" and 42" widths); and self-powered front-mounted rotary mower (36" and 44" wide); lower left; new underneath-mounted rotary (32" and 44" wide models); also front-mounted 30" reel mower, and choice of "Yardman" and "Pennsylvania" 3-gang reel mowers.

SPEEDEX "Unit-Design" Tools are all heavy-duty—fit and work efficiently—require minimum service—all guaranteed one year.

Try a SPEEDEX Tractor on your toughest jobs. It will prove itself and show you that a SPEEDEX fleet investment is your thrifty and wise decision.
Write for color folder today. Dealer Inquiries Invited.



SPEEDEX Tractor Co.
377 No. Freedom
Ravenna, Ohio

400 Tons an Hour With Only 64 Hp . . .

100. That's just one report on the Koehring "Skooper" which is combining the full-revolving swing of a shovel with the big bucket capacity and versatility of a tractor loader, giving a new concept in speed loading. Cuts costs at every turn. Address Koehring Div., 3026 W. Concordia, Milwaukee 16, Wis.

Got to do Asphalt Mixing or Patching?

118. Whatever the job, speed and simplify your work with modern Wylie equipment for hot or cold paving materials. As the first step to improved performance get new data from Wylie Mfg. Co., P. O. Box 7086, Oklahoma City 12, Okla., or use the reply card.

Chain That Pays For Itself

134. Aluminum chain for protective barriers for roads, parking lots and work areas, and as guard rails inside water, sewerage and electric plants, pays for itself by eliminating maintenance. For specification folder, price list and sample links, address Bison Aluminum Chain Co., Inc., Dept. C-P, 249 Hertel Ave., Buffalo 7, N. Y., or circle number on card.

Compact Wheel Tractor Makes Maintenance Jobs Easy

172. Rugged and powerful yet exceedingly low in cost, the Speedex Model S23 tractor with 9 hp engine will work for you all year around on park and yard maintenance chores. Attachments include gang and rotary mowers, cutter bar, front and rear blades. Check advantages of this versatile machine by writing Speedex Tractor Co., 367 N. Freedom St., Ravena, Ohio.

Illustrated Specifications on Brush and Limb Disposal

222. A new booklet on the modern approach to the brush problem shows how an Asplundh chipper reduces bulky branches and brush trimmings to chip size for mulch or easy removal. Write Asplundh Chipper Company, 501 York Road, Jenkintown, Pa., or use the handy reply card.

Cut Labor and Cost of Replacing Sweeper Brooms

259. Here's a revolution that is as simple as putting a nut on a bolt. For the full RADAX story of no cores to buy, no changes in present equipment, far fewer man-hours to pay for, address Rynal Corp., 114 St. Joseph St., Arcadia, Calif., or check the reply card.

Eaton 2-Speed Axles For Your Trucks

264. Truck axles that provide easy shift, supply positive lubrication and have a self-contained air brake are available from Eaton Mfg. Co. For complete information on these rugged axles check the reply card or write Eaton Mfg. Co., Cleveland, Ohio.

Slide Rule Plans Hazard Warnings Placement

265. This clever adaptation of the slide rule principle tells at a glance practically every factor governing the placement of signs, flagmen, traffic cones, barricades, lanterns, torches and flashers. To get the Dietz Hazard Warning Planner, address Dept. RB, R. E. Dietz Co., Box 1214, Syracuse 1, N. Y., or check the reply card.

Reinforced Concrete Cribbing for Highways and Embankments

267. Typical wall sections and details of standard units of open or closed face concrete cribbing are covered in catalog from American Marietta Co., Concrete Products Div., American-Marietta Bldg., 101 East Ontario St., Chicago 11, Ill. Check the reply card for general specifications and installation of the cribbing.

Manual on Steel and Wire for Road Building

337. Design data on wire fabric for concrete pavements, joint data, cable highway guard, wire fabric, steel and wire for concrete pipe and reinforced bituminous concrete design are some of the sections covered. Check the reply card or write American Steel & Wire Div. of United States Steel Corp., Cleveland 13, Ohio, for this valuable manual.

ONLY ROTO·PAC HAULS AN EXTRA LOAD EVERY DAY WITHOUT EXTRA EQUIPMENT OR EXTRA PAY!

That's what the time saved on any route by ROTO-PAC adds up to, thanks to continuous loading plus continuous compaction.

SEE IT IN ACTION WITHOUT LEAVING YOUR OFFICE . . .

Color movies of the world's finest and fastest rubbish collection unit show the versatility of ROTO-PAC on both typical and unusual routes. Prefer a "live" demonstration? A letter or phone call arranges it. No obligation, of course.

P.S. At the same time you'll see the ultimate in container systems — built to handle both manual and automatic loading of containers ranging from ½ to 6 yards from dock or street level.

CITY TANK CORPORATION
(A Unit of Hagan Industries, Inc.)
53-09 97th Place, Corona 68, N. Y. • NE 9-9800

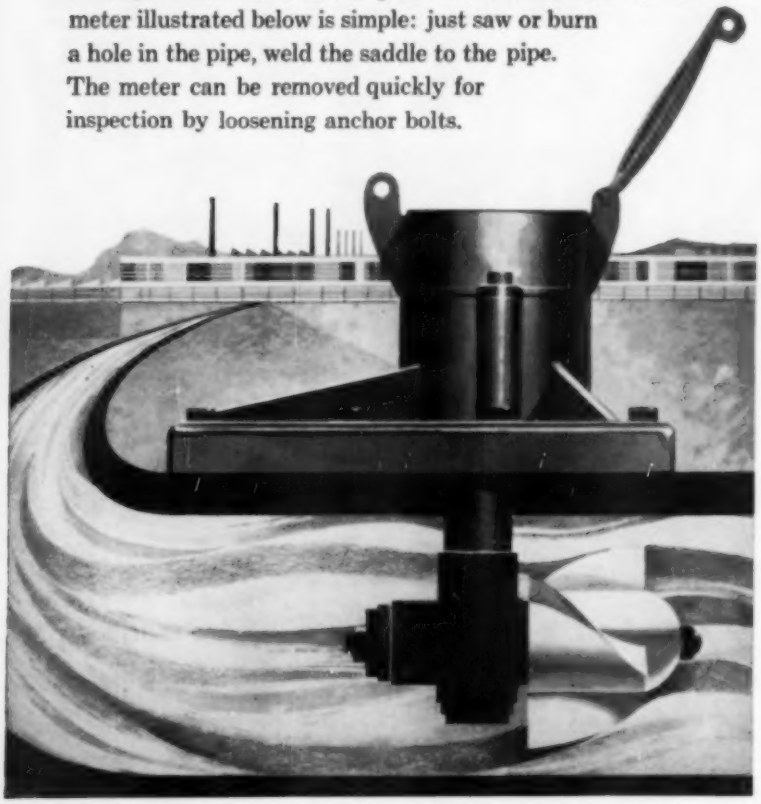
To order these helpful booklets check the reply card opposite page 34.

Increase efficiency and water profits with

MEASURE-RITE propeller meters

Measure-Rite meters can be installed on new or existing lines . . . for accurate, dependable water metering control.

They will register accurately whether mounted in horizontal, vertical or *inclined* positions. Installation of the meter illustrated below is simple: just saw or burn a hole in the pipe, weld the saddle to the pipe. The meter can be removed quickly for inspection by loosening anchor bolts.



Free flow design
assures low loss of head

In the Measure-Rite assembly, the propeller is positioned *forward*, fully centered in the metering chamber for greater metering accuracy. Free flow design provides least restriction of flow — minimizing loss of head.

Send for Bulletin MR-105 describing the complete line of Measure-Rite propeller meters. Address inquiries to:

MEASURE RITE, INCORPORATED

A Subsidiary of BADGER METER MFG. CO.
4545 W. BROWN DEER RD. • MILWAUKEE 18, WISC.

Stumped by Stumps?

303. Pow-R-Stump cutter is operated by one man, handles stumps of any width and up to 33 ins. in height and will not damage curbs, driveways or sidewalks. For literature check the reply card or write Vermeer Mfg. Co., Pella, Ia.

Don't Dig—Auger

338. Modern earth augers and their applications in installations under lawns, streets, highways, walks, buildings, etc. are discussed in this bulletin, A1-10M-2-60. Write to Modern Products, Inc., Exeter, Nebraska.

Power-Controlled Motor Graders

338. Three models of motor graders with torque converters and power shift transmissions are described in detail in bulletins, No. HWG-521 and HWG-508 available from the Huber-Warco Co., Marion, Ohio.

Power Tamper for Granular Soil and Bituminous Surfacing Work

342. The Kelley Power Tamper is a self-propelled unit that is equivalent to a 10-ton roller for backfilling, road widening jobs and compacting around culverts and pipeline trenches. For complete specifications write Kelley Machine Div, Wiesner-Rapp Co., Inc., 285 Chicago St., Buffalo 4, N. Y., or check the reply card.

Fertilizer Distributor for Parks and Roadsides

362. Uniform spreading, even on rough ground, and simplified maintenance that assures long, economical use are features of the Lely fertilizer distributor. Colorful brochure giving full details is available from Lely Ltd., 2113 Paisley Ave., Burlington, Ontario.

Prompt Service on Sweeper Refill Fibers

367. Here's a dependable source of power sweeper refill fibers, including domestic and imported types and gutter broom wire. To get all the data write A. Steiert & Son, Inc., Hatfield, Pa., or use our reply card.

Slurry-Seal Spreader For Surface Sealing

370. The new slurry-seal method with the Tarco spreader gives a thin, even application of asphalt-sand-water slurry and fills and seals cracks and makes skid-proof surfaces. Check the reply card or write Tarrant Mfg. Co., 28 Jumel Place, Saratoga Springs, N. Y., for complete details.

End Traffic Streaks on Traffic Paint

453. Learn how you can turn traffic loose on pavements painted ten minutes before with Parlon chlorinated rubber base traffic paint, with quick drying, long-time toughness and abrasion-resistance. Booklet that tells more is available from Cellulose Products Dept., Hercules Powder Co., Wilmington 99, Del.

Complete Line of Asphalt Patching Mixers

386. Mixers capable of mixing 3 to 20 tons of hot mix per hour are described in literature available from McConnaughy Mixers, Inc., Lafayette, Ind. Check the reply card for full information on patching, repairing, resurfacing and sealing.

Vacuum Cleaner and Leaf Collector For Cleaner Streets

395. A unit is now available that can be mounted on a right-hand drive jeep or a pick-up truck for picking up gutter trash and leaves. Complete specifications, capacity, operation and installation procedures are covered in a bulletin available from Tarrant Mfg. Co., Saratoga Springs, N. Y.

Sweepers Handle A Variety of Jobs In Every Season

484. Mechanical drive one-way and pull type 2-way sweepers and hydraulic 2-way sweepers that are tractor-mounted or loader-mounted are fully covered in literature from M-B Corp., 1611 Wisconsin Ave., New Holstein, Wisc. Jobs like cleaning dust, dirt and snow from streets and highways and sweeping park lawns are a few of the sweepers applications. Check the reply card.

A fine point
in Badger
meter accuracy:
Old-style longer slot weakens chamber halves, with possibility of distortion.
Exclusive dovetail thrust roller insert

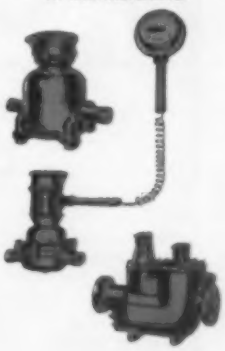
cuts wear and noise at the water level

It's standard on all Badger Disc meters. Dovetail thrust roller insert fits vertically into the thrust roller slot to form a smooth track on which the roller rides countless times — quietly without wear. With the slot 77% shorter, original strength is retained and possible distortion in this area is eliminated.

Accurate registration is constant because the nutating disc never shifts position. After many years of service an inexpensive insert can be replaced if necessary (instead of a possible chamber replacement).

The dovetail thrust roller insert is just one of many refinements to emerge from Badger's concentration on *meter* research and development. For further details, see your Badger representative. Ask him, too, about the new Read-o-Matic outdoor meter-register. Proof that answers for better water metering come first from Badger.

BADGER'S BIG PARADE OF PRODUCTS FOR BETTER WATER METERING



Badger Water Meters

BADGER METER MFG. CO. • 4545 W. Brown Deer Rd., Milwaukee 23, Wisconsin • *Offices in Principal Cities*

To order these helpful booklets check the reply card opposite page 34.

CONSTRUCTION EQUIPMENT AND MATERIALS

To Keep You Up-to-Date . . .

22. On tractor loaders, motor graders and tractor shovels, Allis-Chalmers keeps bringing out new literature that is well worth your while. Ask them for it, specifying where your interest lies. Write Allis-Chalmers Mfg. Co., Tractor Group, Box 512, Milwaukee 1, Wis. or circle our card.

Don't Stand There Figuring!

51. Use the new Forney PSI Calculator "slide rule" for concrete products that includes instant conversion data from total load to psi on 17 standard test specimens and masonry units. Pocket size. Free. Address Forney's Inc., Tester Div., Box 310, New Castle, Pa.

Manual on the Use and Application of Compactors

261. A Manual covering the various types of compaction equipment in use today and including rollers and vibratory compactors is available from The Galion Iron Works & Mfg. Co., Galion, O. Check the reply card for details on the problems encountered in the efficient compaction of various materials, and the correct use of communication equipment available.

Booklet Shows Design of Pre-Engineered Steel Buildings

271. Pre-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful four color booklet you will find details on several basic designs for community use; answers to your questions on construction and erection; and many illustrations of typical uses. Write to Butler Mfg. Co. 7321 East 13th St., Kansas City, Mo.

56-hp WISCONSIN ENGINE
cuts snow removal costs 3 ways
The husky air-cooled four-cylinder Wisconsin can keep you from being snowed-under — literally and by costs.
The engine brings you low-cost attachments, like the Sno-Thro, to mount on rolling stock you already own. And it's powerful enough to handle the heaviest snow — around the clock and in sub-zero cold.
The heavy-duty Wisconsin is precision-built for long life, minimum wear, and lowest upkeep cost. You can count on it whenever emergency strikes — and to stay on the job until it's over.
Factory parts and service are available through 2000 Authorized Wisconsin Service Stations. You can get parts from stock when you need them. Prompt, expert servicing puts your engine on the job before you even miss it.
Keep your streets open for less money this winter with Wisconsin-powered equipment. Engine sizes 3 to 56 hp. Get Bulletin S-251 on the entire line. Write Dept. U-20.
WISCONSIN
MOTOR CORPORATION
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines
WISCONSIN-POWERED SNO-THRO, made by Wausau Iron Works, Wausau, Wis., enables one man to remove up to 15 cu. yds. of snow per minute. It can be used for piling or loading trucks.
U-329

Tractor Loader Can Be Converted Into Eight Different Machines

38. Multiple-purpose tractor loader can be converted to a street sweeper, backhoe, fork lift, angle dozer, crane and rotary broom in a short time. Check the reply card or write Massey-Ferguson Industrial Div., 1009 South West St., Wichita 18 N. Kans., for well illustrated catalog.

A Fully Rotary Compressor by Jaeger

209. Complete information is available from The Jaeger Machine Co., Columbus 16, Ohio on this 2-stage, oil-cooled rotary compressor. Features include 80% fewer moving parts, up to 30% less weight, vibrationless operation and 100° cooler air.

Be Informed on Forming

282. Forming applications, tie spacings, typical panel layouts, corner details, stripping procedures and radius wall forming are diagrammed and discussed in bulletin, AIA File 4-D-3. Get yours by writing to Gates & Sons, Inc., 80 So. Galapago Street, Denver 23, Colorado, or send us the reply card.

How to Get Better Concrete Bonding

307. Whether your problem is bonding old to old concrete, new or fresh concrete to old concrete, or remedial patching and anti-skid surfacing, there is help in a very new informative booklet on Thiokol liquid polymer epoxy concrete adhesive. Just write Thiokol Chemical Corp., 780 N. Clinton Ave., Trenton 7, N. J.

Tractor-Shovels With Drott "Four-In-One" Attachment

352. Hough rubber-tired front-end loaders come equipped with the Drott "4-in-1" bucket. Check the reply card or write The Frank G. Hough Co., Libertyville, Ill., for literature on how to use this unit as a shovel, clamshell, scraper and bulldozer.

For Better Work All Over Town

325. Put a Bantam in your life. On trenching, excavating, street and highway work this handy versatile crane-excavator obviates using larger equipment in many cases. Saves time and dollars. Get descriptive literature from Schield Bantam Co., 301 Park St., Waverly, Iowa or circle card-number.

Design Manual on Sectional Plate Pipes, Arches and Pipe-Arches

350. Size and weight tables, minimum gages for live load strutted and unstrutted, layout details and plan developments are some of the material covered in this manual. Write American Bridge Div., United States Steel Corp., 525 William Penn Place, Pittsburgh, Pa.

"Rip the Daylights out of Masonry Sawings Costs"

635. What to do it with is fully described in new literature "New from Truco" on drilling machines, bits and accessories; also concrete, masonry and stone saws and diamond blades. Address Truco Masonry Drilling Division, Wheel Trueing Co., 3200 West Davison, Detroit 38, Mich., or circle number on our card.

For Soil Sampling and Pavement Coring

576. There's an easier way to do both with Acker equipment. Bulletin 26-R describes a kit containing 12 different soil sampling tools. Bulletin 40-R tells about the All-Purpose auger for all types of sub-surface exploration. Bulletin 700-R illustrates the Acker Shear Test Kit for in-place shear tests in soft areas. Name the ones you want. Acker Drill Company, Inc., Box 830, Scranton, Pa., or check our card.

Construction Guide For Engineers and Builders

669. A 34-page four sectioned construction guide containing full-page structural drawings that provide basic information on types, grades and applications of fir plywood for engineers and builders has been released by Douglas Fir Plywood Association, Tacoma 2, Wash. Check the reply card for data on floor construction, single and double wall construction and roof construction.

(More listings on page 52)

Plan NOW!

...for BARE PAVEMENTS ALL WINTER!

Don't get caught short by an early blast of winter that ices up your roads. Plan to use Solvay® Calcium Chloride at money-saving *bulk* rates*. It can be stored alone, or mixed with salt, outdoors under tarpaulin covers, in indoor sheds or covered bins. This method helped leading turnpikes achieve "no shutdown" records—despite severe, *unexpected*, weather conditions!

Bulk handling of Solvay Calcium Chloride is a one-man operation, both in loading and application. It can be used economically by large and small highway departments.

Calcium chloride-salt mixtures are effective at all temperatures and humidities. While salt's best range is 25-32°F., calcium chloride speeds melting at all temperatures, even down to below zero . . . provides the moisture salt needs to act. Calcium chloride liberates heat as it melts ice, which helps salt work faster. When you combine the two, applications can be lighter and less frequent. This reduces chemical consumption and lowers cost.

For *instant* skidproofing of icy surfaces, treat abrasives with Solvay Calcium Chloride. They hold fast in wind and traffic at all temperatures.

**Also available in moistureproof bags.*

ACT NOW! MAIL THE COUPON!

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SOLVAY PROCESS DIVISION
61 Broadway, New York 6, N. Y.

SOLVAY branch offices and dealers are located in major centers from coast to coast.

SOLVAY PROCESS DIVISION 74-90
ALLIED CHEMICAL CORPORATION
61 Broadway, New York 6, N. Y.

Please send:

☐ Folder—"Ohio Turnpike Procedures for Clear Pavement" (C.C.I. Lit.)
☐ Folder—"Chemical Mixtures in Winter Maintenance Work" (C.C.I. Lit.)
☐ Without obligation. I'd like to discuss one-man bulk handling of calcium chloride with your representative.

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WORK AWAY...

WORRY-FREE

...NO ROLLER GREASING EVER!

The 72-hp Allis-Chalmers HD-6G is the only 1½-yd tractor shovel with permanently lubricated tapered roller bearing truck wheels, idlers, support rollers—gives you certified protection . . . saves greasing time, materials and money.

The PERMA-SAFE truck wheels, idlers and support rollers in the HD-6G are lubricated at the factory . . . need no further greasing regardless of conditions. PERMA-SAFE design with Positive Seals and tapered roller bearings keep lubricants in . . . dirt and moisture out . . . *for life.*

In addition to timesaving, care-free track lube, the HD-6G also features super pry-out action, highest dumping clearance, fastest reverse and many more big tractor shovel advantages.

Your Allis-Chalmers construction machinery dealer will be glad to put an HD-6G through its paces on your toughest job. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

move ahead with

ALLIS-CHALMERS

... power for a growing world

"Call FOSTER... get Line Pipe PLUS"

When you need large diameter pipe, especially 12¾" thru 48", L. B. Foster Co. can supply all you need from any one of its seven nationwide warehouses. And where's the "plus"? It's the "Faster From Foster" service that speeds your order.

As one of the country's major pipe specialists, Foster offers a one stop source to water works engineers and superintendents for municipal and industrial line pipe. This includes bare pipe and "controlled-quality" coating and wrapping—or lining—up to 78" diameters, and to all standard specifications.

Also, check Foster for savings on Structural Grade pipe—ideal for non-pressure use, and for water well casing and pump columns.

Write **L. B. FOSTER CO.** for Stock List PW-9. Pittsburgh 30, New York 7, Chicago 4, Houston 2, Los Angeles 5, Atlanta 8, Cleveland 35.

Faster From Foster

Pipe · Valves · Fittings · Piling · Rail

SNOW AND ICE CONTROL

Uniform Salt Spreading
Saves Material

42. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on their spreader and table of material application rates. Use reply card or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Bare Pavement Maintenance
With Sterling Rock Salt

84. Handbook is designed for road maintenance men who are responsible for safe winter pavements; and is a safe-roads fact book about a modern snow and ice removal program. Check the reply card or write International Salt Co., Inc., Clarke Summit, Pa.

Catalog on Tractor-Driven
Tailgate Spreader

182. Highway Equipment spreader spreads in the echelon pattern for ice control and the blanket pattern for seal coating. For literature write Highway Equipment Co., Dept. H41 616D Ave. N. W., Cedar Rapids, Iowa.

Save on Winter
Ice Control Cost

237. . . . with the faster-working salt described in this new Bulletin B-1159S. Tells what this salt will do and why, and where to get it. Also the bonus you get from using salt for summer road stabilization projects. Address Morton Salt Co., Industrial Div., 110 N. Wacker Drive, Chicago 6, Ill., or use our card.

Snow Plows
For Every Need

294. Frink snow plows are designed to meet snow removal needs at airports, parking lots and streets and highways. They consist of four basic types with models to fit trucks 1½ to 12 tons. For complete data write Frink Sno-Plows, Inc., Clayton, N. Y.

Use The Reply Card

Winter Road Maintenance
With Calcium Chloride

386. This bulletin contains data on why calcium chloride mixtures work better, how and in what percentages to store, mixing methods and recommendations for various storm conditions. Check the reply card or write Columbia-Southern Chemical Corp., One Gateway Center, Pittsburgh 22, Pa., for your copy.

No Idle Trucks with these Spreaders

397. New 8-page catalog gives features, specifications, users' statements on the Fox Mountable spreaders, equally good for sand, cinders, chips, salt, calcium chloride. Designed for one-man operation and year-round use. Wide widths and high speeds. Mounts or demounts in 15 minutes. Write Fox River Tractor Co., Box 469, Appleton, Wisc., or check our card number.

Ice Control Without
Corrosion Dangers

439. Virtually all corrosion is prevented when rust inhibitor "Banox" is used in conjunction with salt for snow and ice control. Properties of this material and performance results are described in bulletins issued by Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa.

How to Make
Icy Surfaces Safe

455. A bulletin on how calcium chloride works in ice control and direction for its use has been made available by Wyandotte Chemicals Corp., Michigan Alkali Division, Wyandotte, Michigan. Other uses of calcium chloride are fully outlined.

Formulation for use in
Thermal Snow and Ice Removal Systems

493. The properties and advantages of Dowtherm SR-1, a heat transfer fluid, and typical installation layouts are covered in catalog available from The Dow Chemical Co., Midland, Mich.

Disc Type Water Meters
Time Tested for High Accuracy
and Dependability

1" SIZE | 1½" SIZE | 2" SIZE

HERSEY

CONICAL DISC WATER METERS MODEL HD

Hersey-Sparling
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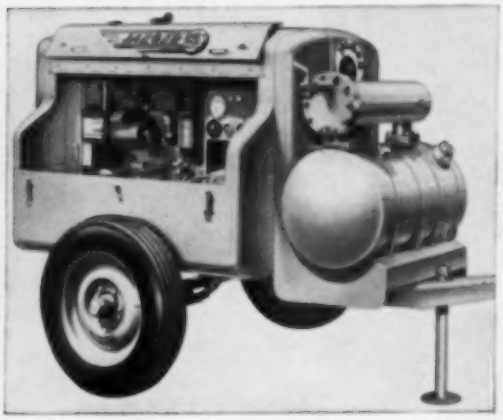
HERSEY PRODUCTS
DEDHAM, MASSACHUSETTS

To order these helpful booklets check the reply card opposite page 34.

75 cfm operates a heavy breaker at top efficiency.



All the air you need for an 80 lb. breaker

JAEGER ROTARY "75"

Easy starting in coldest weather because it has no pistons to drag. Costs less than the reciprocating model it replaces, yet runs smoother, delivers much cooler air, has fewer parts. Fully equipped. Big tool boxes, automatic blow-down valve. Ask your Jaeger distributor or send for Catalog.

The Jaeger Machine Company, 400 Dublin Ave., Columbus 16, Ohio

75 • 85 • 125 • 250 • 365 • 600 • 900 CFM ROTARY COMPRESSORS

Don't Let Cold Weather Stop Paving Repairs

Heat and Remix Stockpiled Asphalt with

HEAT-A-MIX

TAILGATE ASPHALT MIXER

Buy a HEAT-A-MIX now and be ready for winter repairs.

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90% cut in operating and maintenance cost means

CASH in the BANK for you!

New, transistorized

M-SCOPE PIPE FINDER only

$189.50

Rugged, transistorized construction practically eliminates maintenance costs . . . extends battery life to a year or more. Pinpoint accuracy, greatest depth penetration make the M-scope first choice in the field!

Heavy Duty LEAK DETECTOR . $295.00

Send for FREE 1960 Catalog

FISHER

Research Laboratory, Inc.

Dept. PW-6, Palo Alto, Calif

REFUSE COLLECTION AND DISPOSAL

Make Molehills out of Your Refuse Mountains

94. New and better ways of refuse and garbage collection and handling are described in newest literature on collection systems employing giant containers, bodies and trailers that speed your work, cut costs, improve sanitation. Adaptable to small cities as well as large. Write Dempster Brothers, Dept. PW, Knoxville 17, Tenn., or circle the number on our card.

Load-Packer 600 Points the Way to the Best in Refuse Collection

188. Bulletins W-200, W-220 and W-221 explain how the Gar Wood Load-Packer gives faster operation, bigger payload, more compaction, a larger hopper and more dependable operation. Write Gar Wood Industries, Inc., Wayne, Mich., or check the reply card for full details.

Bulk Refuse Collection with or without Containers

192. A bulletin describing the bulk refuse system called the Roto-Pak Container System, which provides an unusual flexibility of service and the handling of all types of trash, is available from City Tank Corp., Corona, N. Y. Check the reply card.

Incinerators for the Disposal of Combustible Wastes

217. Bulletin 184A from Morse Boulger Inc., New York 11, N. Y. describes fully the basic principles of incineration as to combustion, auxiliary burners, draft and control and elimination of fly ash. Specifications and design of incinerators and hopper doors are included.

Complete Package Dravo Incinerator Plant

475. The Dravo incinerator includes automatic refuse and raw sewage sludge handling combustion controls, water wall furnace, ash disposal system, flue gas scrubber and everything necessary for the efficient operation of the plant with minimum personnel. Write for full information to Dravo Corp., Dravo Building, Pittsburgh 22, Pa., or check the reply card.

RECREATION

Put the Kids on Rubber

26. . . . and save bruises and bumps. "SAF-PLA" rubberized playgrounds make friends of parents and patrons. Can be applied to blacktop, concrete, etc. You owe it to the children to learn about "SAF-PLA." Write U. S. Rubber Reclaiming Co., Inc., Box 365, Buffalo 3, N. Y., or check the card.

Heavy Duty Swimming Pool Equipment for Municipal Pools

193. Illustrated bulletin showing heavily built diving and deck equipment is available from American Playground Device Co., Anderson, Ind. Check the reply card for specifications on diving boards, data on diving stands towers, slides, pool ladders and pool cleaning

BUSINESS ADMINISTRATION

If You are Considering a trustee for a Bond Issue Check with Chase Manhattan

236. For details on how a bank serves as trustee for bond issues for any municipal or governmental unit, write The Chase Manhattan Bank, 40 Wall St., New York 15, N. Y.

In Jersey City's Sewerage System

H_2S no danger to concrete pipe protected by Bitumastic Coatings

Some 17 miles of large diameter concrete storm and sanitary interceptor lines were laid to link Jersey City's existing mains to the new East and West Side treatment plants. These plants, opened in 1957, have a design capacity of 83 mgd.

To insure maximum life from the concrete pipe used in the lines, Clyde Potts Associates, consulting sanitary engineers for the Jersey City Sewerage Authority, specified that the pipe be given two coats of Bitumastic Super-Service Black on all interior surfaces. This was done in the yards of the pipe suppliers: Lock Joint Pipe Co., and the American Concrete Pipe and Universal Concrete Pipe Companies, now part of American-Marietta. The sprayed applications of this coal-tar coating filled and sealed the concrete, increasing its impermeability to raw sewage.

According to Mr. James Dolan, Superintendent and Chief Engineer of Jersey City's system, "Periodic inspections of the lines have shown no failures of the protective coating system or sewer gas attack on the pipe."

Wherever concrete or metal surfaces are exposed to sewage gases, sanitary engineers have found that tough, impervious Bitumastic coatings solve the problem of corrosive attack.

SEE OUR CATALOG IN SWEET'S

Koppers has published a helpful brochure on sewage plant protection that's yours for the asking. Koppers Company, Inc., Tar Products Division. District Offices are located in Boston, Chicago, Los Angeles, New York, Pittsburgh and Woodward, Alabama. In Canada, Koppers Products Ltd., Toronto.

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BITUMASTIC
COATINGS AND ENAMELS
another fine product of COAL TAR

Koppers Company, Inc.
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Pittsburgh 19, Pa.

Gentlemen:

I'd like a copy of your brochure on sewage plant protection.

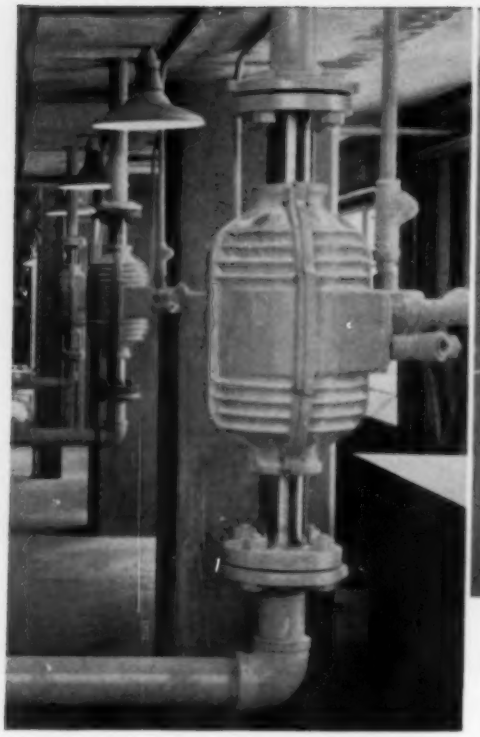
Name_____ Title_____

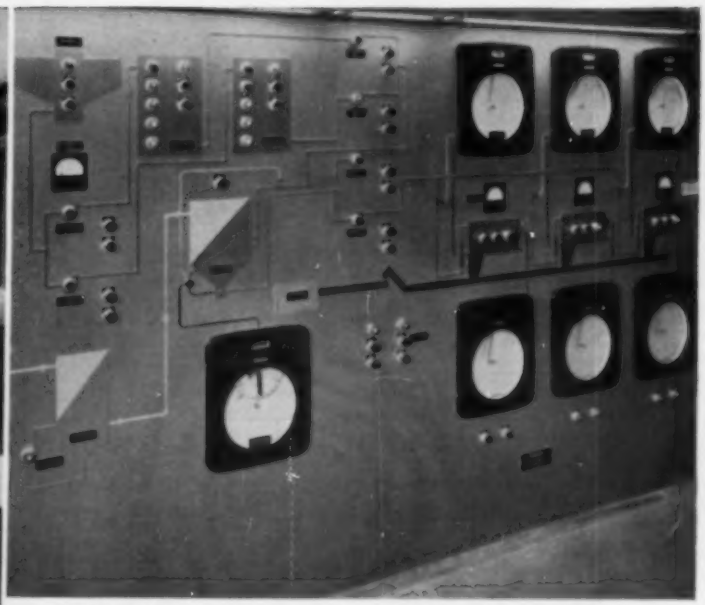
Firm or Authority_____

Address_____

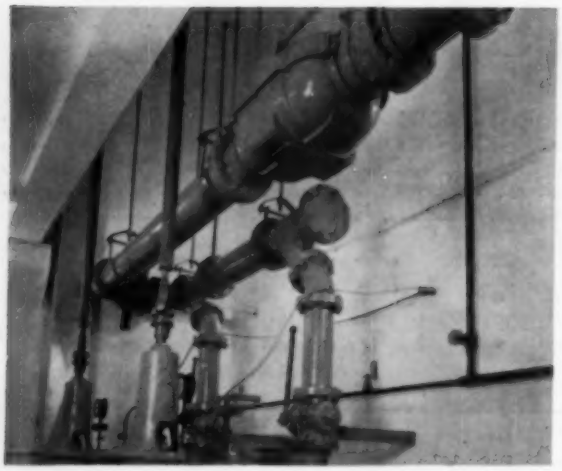
City_____ Zone____ State____

Foxboro Magnetic Flow problems for





DAYTON, OHIO Three Foxboro Magnetic Flow Meters measure flow of sludge to centrifuges at Dayton's Lime Recalcining Plant. Designed around these meters, plant actually recovers up to 20% more lime than originally added to water. Graphic control panel in Feed End Building operates entire plant.



NEWPORT, R. I. At Newport, R. I. influent at the main sewage plant comes from both the town and a nearby Navy base. Determining how much of the total should be billed to the Navy is the job of the Foxboro Magnetic Meter and Foxboro Dynalog Recorder shown above.

Meters eliminate line restriction these municipal utilities

Introduced six years ago, the Foxboro Magnetic Flow Meter has proved its superiority for measuring water, sewage, sludge and other treatment plant flows.

Foxboro Magnetic Flow Meters have no flow restrictions of any type. No taps to get plugged or frozen, no seals or purges, no moving parts of any type. Measurement is made by electrodes flush-mounted in meter wall — then transmitted by electric cable to a Foxboro Dynalog* electronic recorder. Accuracy is ±1%.

Foxboro Magnetic Flow Meters have solved some of the toughest municipal measurement problems. Ask your Foxboro field engineer to show how it can help with yours. Or write for Bulletin 20-14. The Foxboro Company, 269 Norfolk Street, Foxboro, Massachusetts.

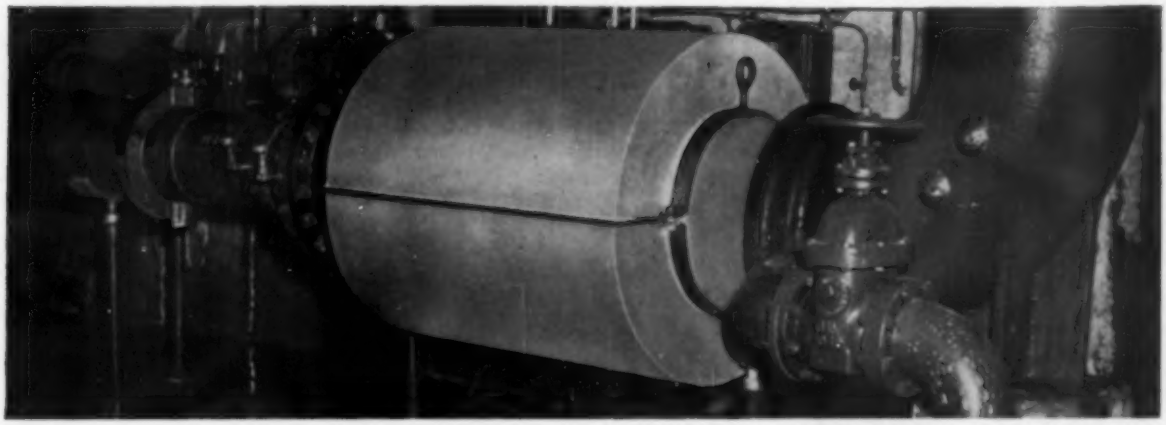
Reg. U. S. Pat. Off.

Partial List of Progressive Communities Using Foxboro Magnetic Flow Meters

Benton Harbor, Michigan	— raw sewage
Hayward, Calif.	— water
Pittsburgh, Pa. (Allegheny County Sanitary Authority)	— raw sewage
Covington, Ohio	— return activated sludge
Medfield, Mass.	— water
Orange County, Calif.	— sewage
Warren Township, Michigan	— raw sewage and sludge
Bloomfield Township, Michigan	— water
Seattle, Washington (Lake City Sewage Plant)	— sludge
Milwaukee, Wisconsin	— sludge
Piqua, Ohio	— sludge
Arkansas City, Kansas	— sewage
Sidney, Ohio	— return activated sludge
Frazer, Michigan	— raw sewage

Meter sizes on these installations range from 3 inches to 6 feet.

FARMERS BRANCH, TEXAS Eight-inch Magnetic Flow Meter at a sewage lift station. Meter was installed below ground level, right next to elbow and valve, without affecting its measurement accuracy.



CHICAGO, ILLINOIS This 20" Foxboro Magnetic Flow Meter was installed in the South District Filtration Plant in April, 1956. Because it has no line restrictions, plant officials knew the meter would add no more pressure drop than an equivalent length of pipe. Note how it was installed directly downstream from an elbow.

FOXBORO

REG. U.S. PAT. OFF.

Municipal Power

DUAL SYNCHRONOUS MOTOR DRIVE FOR CENTRIFUGAL PUMPS

BRUCE J. ENNIS

Principal Engineer,
Burns & McDonnell Engineering Co.
Kansas City, Missouri

THE SOLUTION to a recent pumping problem in a municipal water pumping station involved some unusual principles which might prove applicable in other systems, with regard to the coordination of electric motor drive to high service pumping units.

In this particular station, the treated water is pumped at 350-foot head to the distribution system by two 16 MGD pumps and one 10 MGD pump direct-connected to 2300-volt synchronous motors and by one 16 MGD pump connected to its synchronous motor through a hydraulic coupling which permits output pumpage in the range of from 10 to 16 MGD from the variable speed unit. Below a 10 MGD rate, the discharge rate is not stable and unit efficiencies are low due to excessive losses in the fluid coupling.

Due to the characteristics of the distribution system, proper operation of the pumping station indicates the need for a fifth high service pumping unit, in addition to the four units described above, which can deliver at a 5 MGD rate for the next few years at high efficiency and which may be converted to a 13 MGD pump in the future.

Such a unit will provide an ideal incremental size, when used in combination with the existing pumps, to follow the daily load curves anticipated for the next few years. In addition, the pump will be converted to its ultimate rating (after system load growth dictates the need) by simply changing the 5 MGD impellers to 13 MGD impellers, using the same pump casings, and intake and discharge piping.

The new unit will consist of two single stage 900 rpm pumps connected in series to make a two-stage pumping unit. Pump casings will be of the horizontal shaft double suction type. The design capacity of the initial impellers will be 5 MGD against a total dynamic head of 175 feet in both the suction and discharge stages. Ultimately, the impellers will be changed for a rating of 13 MGD in each stage against the same total unit head of 350 feet, divided equally between the two stages.

Obviously, the motor drive power requirements will not be the same for the initial and ultimate pump impeller installations. Actually, the initial unit will only require 450 HP, whereas the ultimate unit will need 900 HP at design condition output.

In this particular pumping station, other work included the conversion of two D.C. motor drives on low service pumping units to A.C. motor drive. By so doing, it was possible to permit the retirement of two 2300 volt A.C.—250 volt D.C. motor-generator sets used heretofore for the direct current power supply to the low service pumps. Each motor on the motor generator sets is a 450 HP, 2300 volt, three phase A.C., 100% power factor, 900 rpm synchronous motor.

Since these motors had recently been rewound and re-conditioned, and since their speed and horsepower ratings are admirably suited as driving units for the new 5 MGD/13 MGD high service pump, plans have been developed for their continued utilization in the pumping station in the following manner:

The new High Service Pumping Unit No. 5 will be arranged as follows, with all components in-line and axially coincidental:

Item	Component
1	450 HP Synchronous Motor No. 1
2	Coupling with removable coupling bolts
3	Suction Pump Stage No. 1, 175-foot total dynamic head
4	Coupling with removable coupling bolts
5	Discharge Pump Stage No. 2, 175-foot total dynamic head
6	Coupling with removable coupling bolts
7	450 HP Synchronous Motor No. 2

With the initial 5 MGD impellers installed in the suction and discharge stage pump casings, the normal procedure for the next few years will be to drive both stages with Motor No. 1, and leave Motor No. 2 idle by removing the bolts from the Item No 6 coupling. To equalize service hours on the motor, the opposite-hand Item No. 2 coupling bolts will be removed at intervals to permit Motor No. 2 to act as the driving unit after the Item No. 6 coupling bolts are replaced.

In the ultimate development of the unit, when system demands warrant the installation of the 13 MGD impellers in the suction and discharge stage pump casings, Motors No. 1 and No. 2 will be coupled to the suction and discharge stage pumps, respectively, but the Item No. 4 coupling bolts will be removed between the suction and discharge pumps, to permit them to operate without direct interconnection.

If the unit were operated with the Item No. 4 coupling bolts in place, it would be necessary to provide an angular adjustment on one of the motors such that the motor characteristics could be brought into "step." While the two motors are considered duplicates, inaccuracies of fabrication, such as locating the keyway in the shaft and field spider, location of the punching in the stator, etc., could be off sufficiently to allow one rotor to be ahead of the other several degrees. This would cause one motor to "hog" the load.

By operating the pumping unit as separate suction and discharge pumps which are hydraulically connected in series, but which are not mechanically connected through their shafts, these difficulties are overcome.

Another reason for operating the pump unit in this manner, after the 13 MGD impellers are installed requiring the total 900 HP of motor input, is that the starting control is simplified. Two full voltage line starter switchgear breakers will be used, one for each 450 HP synchronous motor. Pushing the start button will start the motor driving the suction pump, and when it is synchronized, the field switch will energize the starting circuit of the discharge pump motor, allowing it to

That's why these "magnetic" meters are the easiest and most economical to repair

It's a fact—the major expense in repairing meters comes from replacing or rebuilding parts that wear out or corrode while operating in water.

There are only two "wet" operating parts in the Rockwell *SEALED REGISTER meters, both in the measuring chamber. *These parts, the piston and piston roller, are the only ones that should ever require replacement.* All other moving parts, including the intermediate, are hermetically sealed in the register casing. Since this sealed construction bars water, dirt and condensation, *no maintenance of the register unit is ever needed.*

With a powerful magnetic drive, effectively shielded to prevent cheating, there is *no stuffing box* to leak, bind, wear or require replacement.

This simple construction means less friction and wear—meters that are much easier and more economical to repair. Write for catalog. Rockwell Manufacturing Co., Dept. 162J, Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Company of Canada, Ltd., Box 420, Guelph, Ont.

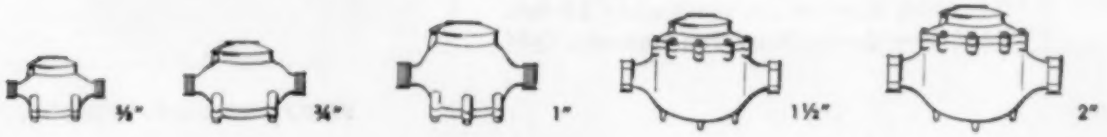
SEALED REGISTER Meters
another fine product by
ROCKWELL

POWERFUL MAGNETIC DRIVE
Illustrating how the driver magnet (shown in hand) revolves around a watertight compartment at the base of the register to push the follower magnet which in turn drives the register shaft.

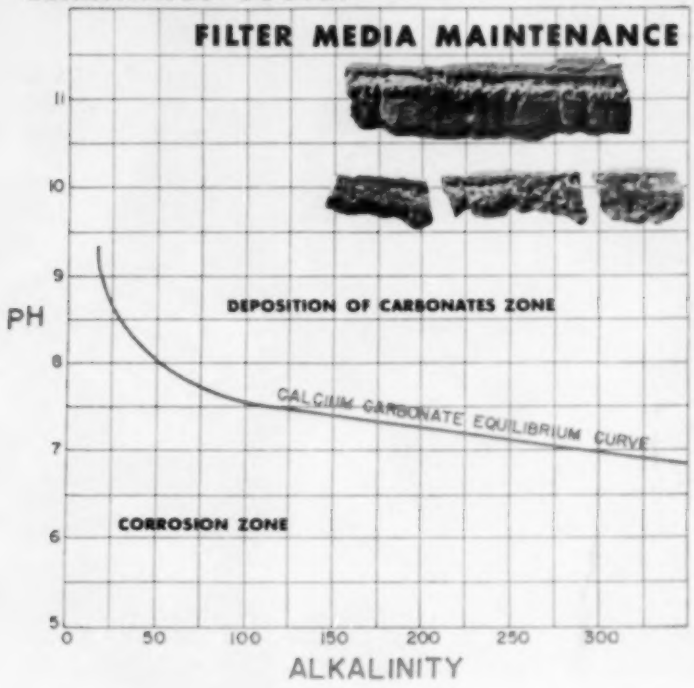
*Trademark

BE SURE TO REGISTER AND VOTE

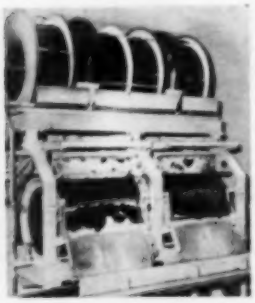
NOW A COMPLETE RANGE OF SIZES



"ROTO-PLUG" SLUDGE CONCENTRATOR ELIMINATES COSTLY FILTER MEDIA MAINTENANCE



The "Roto-Plug" Sludge Concentrator dewaters sewage sludge without the use of conditioning chemicals. This feature eliminates the costly problem of periodic acid washing of filter media to remove calcium carbonate deposits. Where chemicals are used to condition sludge it adjusts the pH of the sludge upward to pH 9 or higher and causes the formation of calcium carbonate. When referred to the carbonate equilibrium curve of water practice, the condition of the sludge is found to be high in the "deposition of carbonate zone".



The "Roto-Plug" works with the sludge "as is" thereby eliminating the age-old problem of decreased production due to calcium carbonate blinding of filter media.

For full details about the economical "Roto-Plug" method of dewatering sewage sludge write for our four-page illustrated folder RP-100.

NICHOLS ENGINEERING & RESEARCH CORP.

80 Pine Street, New York 5, New York
3513 N. Hovey Street, Indianapolis 18, Ind.
405 Montgomery Street, San Francisco, Calif.

come up to speed and synchronize. When the second pump is synchronized, the discharge cone valve will be energized to open slowly.

If a single starting breaker were used, to start both pump motors simultaneously, locked rotor inrush currents for the total combined 900 HP of motor drive would require the added complexities and expense of a starting reactor and running breaker in the switchgear control due to necessary limitations in permissible inrush current in the 2300 volt power supply system.

In the scheme which will be used for the control and protection of the two motors, each full voltage line starting switchgear unit will be provided with individual thermal overload and short circuit protection, and field application relays for its respective motor, arranged to trip both motor breakers in case of trouble on either or both units. Equipment which will serve both units in common will include a watthour meter and undervoltage protection relay.

One of the reasons for using the specific dual motor drive as described above was, of course, the fact that the two motors were already available at the plant site for the intended service; however, the same basic principles might be applied as well for a pumping unit on other systems which would require the purchase of all new equipment, including new motors, under the following general premises:

1. Pump discharge pressures and ratings requiring two single-stage pumps hydraulically connected in series and designed to permit the changing of pump impellers in the same casings.

2. Initial pumping flow requirements approximately one-half of ultimate output desired for the unit, requiring the initial purchase of only one half-capacity motor and associated switchgear breaker section, and permitting the deferral of a second half-capacity motor and switchgear section until the ultimate pumping output is required.

3. Electric system current inrush limitations restrictive to simultaneous line starting of two half-capacity motors or a single full capacity motor, but not restrictive for the individual starting of half-capacity motors across-the-line.

The feasibility of using a single motor, and later on a dual motor drive for a two-stage pumping unit in a given pumping station will depend on the results of economic studies for that particular station.

Sewage Pump Well Elevation Held at 114.5′±3″ Despite Big Variations in Flow

Three of four E-M 200 hp, 1200 rpm Vertical Synchronous Motors with Adjustable-Speed Magnetic Drives at Nut Island Sewage Treatment Plant of the South Metropolitan Sewage System in Quincy, Massachusetts.

E-M Vertical Synchronous Motor and Magnetic Drive Unit for adjustable-speed power transmission to vertical centrifugal pump. The ring element (1) mounted directly on the motor shaft turns at motor speed. The magnet element (2), mounted inside the ring element, has no mechanical connection to the motor . . . torque is transmitted through magnetic flux linkage between ring and magnet. By varying amount of excitation to magnet, pump speed can be precisely controlled.

AMAZINGLY PRECISE CONTROL OF SEWAGE PUMPS OBTAINED WITH E-M ADJUSTABLE-SPEED MAGNETIC DRIVES

One of the critical problems in operating Boston's new Nut Island Sewage Treatment Plant is complete control over the wide daily, weekly or seasonal flow variations. For example, flows may vary from 63 mgd to 249 mgd, with peak loads of nearly 300 mgd during stormy periods.

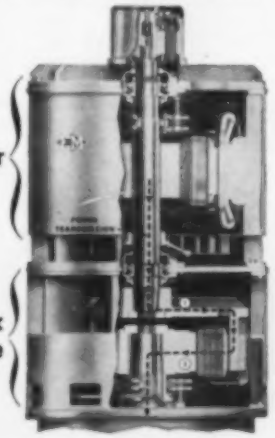
The pump well has to maintain an elevation of 114.5 feet with not more than 3 inches variation, to assure proper levels and flow velocities in the sewage processing channels. Control of the output of the low-lift sewage pumps has to be fast and remarkably accurate.

Use of E-M Adjustable-Speed Magnetic Drives for the low-lift pumps provides the sensitive speed control necessary in maintaining this close command of the pump well elevation.

Pump speed changes are dictated by a well float that actuates the Magnetic Drive through an E-M "Regutron" Control. Pump speed is automatically increased or decreased to maintain precisely the required pump well elevation. The Magnetic Drives are highly important and effective factors in most efficient operation of the Nut Island Sewage Treatment Plant for eliminating pollution in Boston Harbor.

For more information, see your nearest E-M sales engineer. And write direct for a copy of E-M Synchronizer No. 38 which tells the complete story of this outstanding installation.

ELECTRIC MACHINERY MFG. COMPANY
MINNEAPOLIS 13, MINNESOTA



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Specialists in making motors do
EXACTLY WHAT YOU WANT THEM TO

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BLOWER TYPE PLOWS are efficient self-powered units that interchange quickly with the bucket — can blow far to the right or left or deliver directly into trucks.

"V" TYPE PLOWS combined with powerful 4-wheel traction and hydraulic lift of the "PAYLOADER" can break through heavy drifts — are also available with wing attachment.

ONE-WAY PLOWS and reversible side-cast plows are also available for most "PAYLOADER" models. One-way plows are also available with wing attachment.

SNOW LOADING BUCKETS especially large for snow work — or regular buckets — can always be used to load snow from parking lots, street windrows or street corners.

Fight Snow 4 Ways

These tractor-shovels work for you the whole year through

When you invest in a "PAYLOADER", you get *more* than a tractor-shovel . . . you have a potential *fleet* of construction and maintenance equipment to handle, not only the regular tractor-shovel jobs, but scores of specialized jobs normally requiring single-purpose machines.

Widest Range of Tools

A "PAYLOADER" can be equipped with a greater variety of proven attachments than any other tractor-shovel, each tool specifically and exclusively engineered for the "PAYLOADER" applications. They are easily and quickly installed and many permit the use of the bucket in conjunction with the attachment. Only a "PAYLOADER" offers you this maximum versatility, productivity and economy to reduce your equipment investment.

For the Snow Belt

For snow fighting alone, there are several attachments from which to choose: regular or special-large snow buckets; self-powered rotary plow; powerful drift-busting "V" plow; "one-way" and reversible blade plows.

Four-in-One Bucket

A "PAYLOADER" equipped with a patented Drott 4-in-1 bucket has no end of uses for public works, because it can function as a shovel, bulldozer, clamshell or self-loading scraper. This special bucket is available only on a "PAYLOADER" in the rubber-tired field.

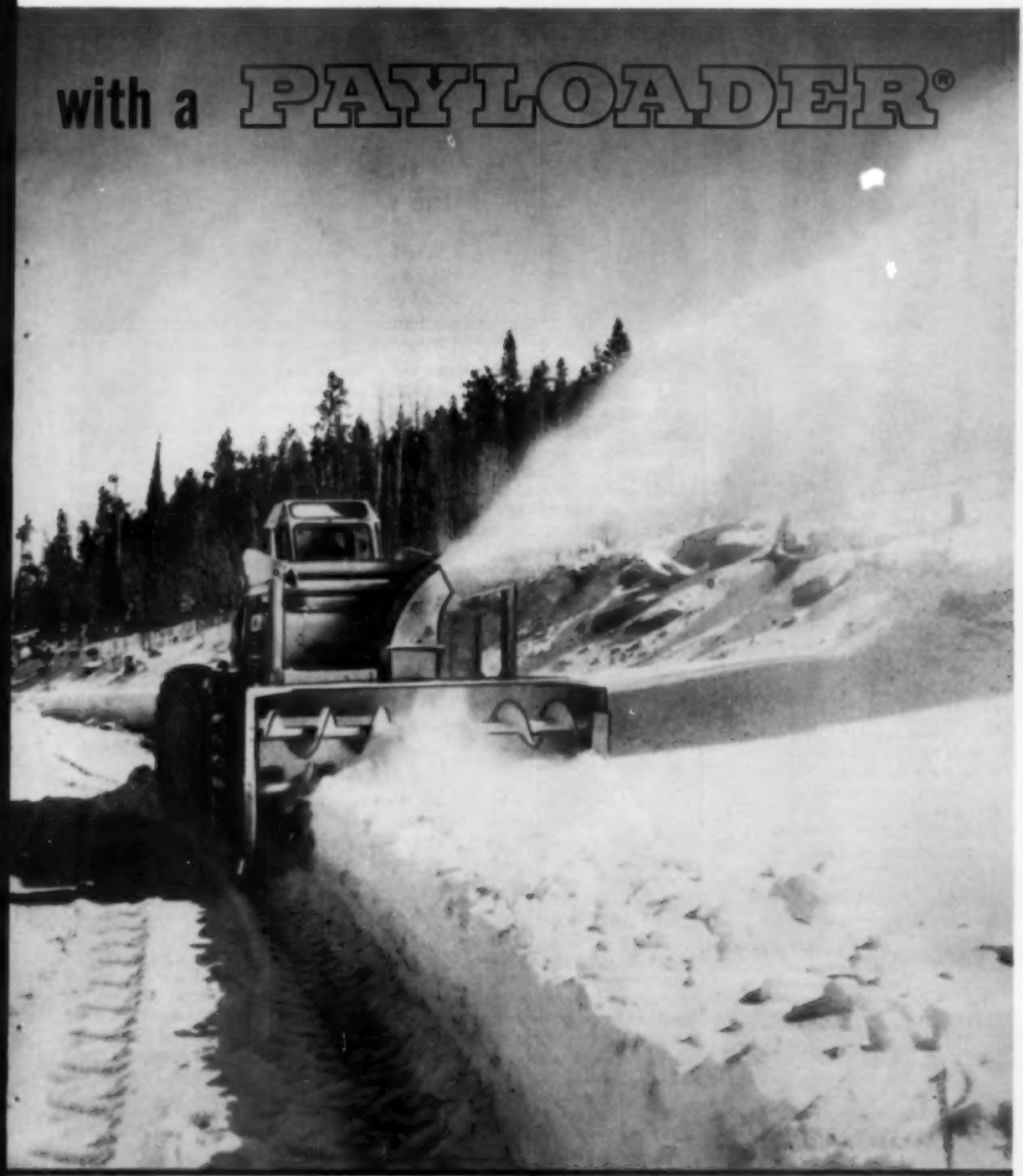
Other Useful Attachments

Some of the many other "PAYLOADER" attachments of special interest to public works departments include the back-hoe, the pick-up sweeper, a high-capacity leaf loader, a blacktop spreader, a side-boom, and a vibratory compactor.

Wide Range of Sizes

Proven "PAYLOADER" tractor-shovels are available in a wide range of sizes to fit the requirements of any public works department, and they are backed by the largest, most experienced network of distributors in the industry.

with a PAYLOADER®



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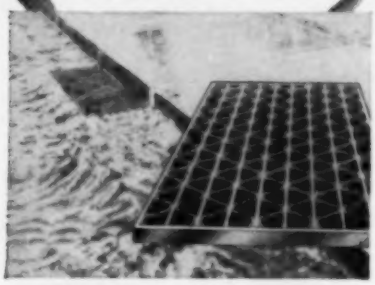
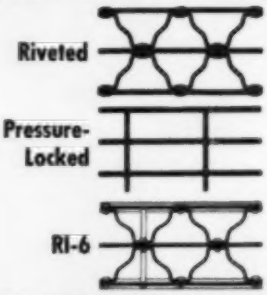
FLOODED HIGHWAYS HINDER TRAFFIC



OLD heavy cast iron draingrates, averaging at best 40% clear opening, often fail to carry off rain water fast enough during heavy downpours, resulting in flooded highways—particularly at underpasses. Also, cracked draingrates must be replaced.

With open steel mesh draingrates, larger clear openings reduce the likelihood of flooded highways considerably. Irving "Dryway" Draingrates are 75% open for greater drainage and are made of steel bars on edge, not subject to cracking.

Available in three basic designs:



Write for brochure on "Dryway" Draingrates
Self-maintaining, Lightweight, Economical, Safe

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Originators of The Grating Industry Est. 1902
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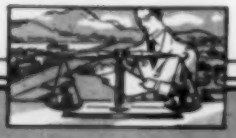


LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Sanitary Sewer Backup

Gregory v. City of Garland, 333 S.W. 2d 869, a Texas case decided Dec. 18, 1959, was an action by homeowners against the city for damages resulting from negligent maintenance of the sanitary sewer system in that sewage was permitted to back up and overflow into their home because of clogging of the sewer at the rear of plaintiff's home.

When the backing up started, Mrs. Gregory called the city's sanitation department. The police answered, stating that they were taking all emergency calls, and saying that they would be right over, but they did not, in fact, come despite the fact that she made several more such calls. The sewage finally spread all over the floors of the house, bedrooms, hallways, etc. The family spent that night with relatives, and went to the City Hall the next morning to report the situation. A city truck then went out, found a blockage in the sewer, and removed it within five minutes.

The city testified that, at the time, the city was being subjected to violent rain storms, and there was a tornado alert on. All police personnel were under emergency operations, the men working 12 to 16 hours each, having evacuated residents of other sections on account of flood conditions. The case went to the jury on a negligence theory, and the jury held that the city had not been negligent. The judgment in favor of the city was affirmed on appeal.

Injunction to Prevent Flooding

Allen v. City and County of Denver, 351 Pac. 2d 390, a Colorado case decided April 25, 1960, was an action for damages and for an injunction to prevent water accumulation in streets of a section of the city. The plaintiffs sought a temporary injunction, pending trial on the merits, and offered voluminous evidence to show the need for such a temporary injunction. Among other things, the plaintiffs sought to enjoin the city from blocking the drainage ways with its streets and sidewalks and with culverts too small to carry the reasonably expected volume of water.

This could only be done, however, by a rebuilding of the streets, sidewalks, and culverts, an undertaking of great magnitude. The court refused to grant such a temporary injunction, on the ground that such relief could not be granted prior to the actual trial regardless of the amount of evidence shown by the plaintiff or of the pressing need for quick action.

Sewer Flooding

Beck v. City of New York, 199 N.Y. S. 2d 584, a New York case decided March 16, 1960, was an action by a large number of resident property owners to recover damages from the city resulting from flooding of lands and dwellings, due to overflowing of sewers in that area. The complaint alleged primarily: 1) That the city constructed a storm sewer of insufficient capacity; 2) that the city negligently granted building permits for new construction in the area and negligently permitted these new owners to connect into the already overburdened sewer; and 3) that the city constructed and maintained inadequate and defective catch basins.

The court held that a municipality owes no duty to construct sewers for the disposal of surface waters, regardless of what harm may thus result. Therefore, the city cannot be liable for failure to provide a drainage system sufficient to dispose of surface waters flowing as a result of the natural drainage and the grading and paving of streets.

The city thus could not be liable unless its activities increased the

Right! There's no rodding necessary because roots just can't get in and clog up Transite®, *the white sewer pipe.* Johns-Manville's patented Ring-Tite® Joint keeps out even the thirstiest of these system disrupters. And it remains impenetrable for the duration of the line. Remember, by keeping roots out you eliminate the major cause of expensive periodic cleanouts . . . an expense which can run over $2,000 annually per mile of pipe in a system having joints that are not tight.

Actually, Transite starts saving you money from the very beginning. Its long length and light weight make this asbestos-cement pipe easy to handle in trucking, moving and lowering into the trench. Once in the trench, Transite adjusts easily and speedily to accurate line and grade. And that Ring-Tite coupling makes a dependable joint quickly and effortlessly. You'll save on operation costs too, because Transite's low coefficient of friction ($n = 0.010$) means faster flow and shallower trenches.

Hartley knows what he's talking about when he says that Transite can cut *your* sewer system costs. Get all the details on Transite, the white sewer pipe. Write Johns-Manville, Box 14, PW-2 New York 16, New York. In Canada: Port Credit, Ontario.

JOHNS-MANVILLE
TRANSITE PIPE

JM

Back at the turn of the century it didn't matter much what size you were . . . capacity counted most. Of course the days of the big schuper and free lunch have disappeared from the American scene. However, another type of "joint"—this one tailor-made for ***all sizes*** of vitrified clay pipe, has been gaining in popularity by leaps and bounds. It's KAUL Presto-SEAL, with precision-dimensioned, factory-molded polyester spigots and sockets that ***joint like magic.*** This revolutionary development reduces shear load action to the minimum and permits a tight, equalized compression throughout the full circumference of the pipe. It's **EASY** to assemble without special tools. It's **FLEXIBLE**, regardless of temperature . . . will absorb all line movement. It's **PERMANENT** . . . leak-proof, root-proof, corrosive-resistant . . . provides trouble-free service forever. It's **ECONOMICAL** . . . less trench space is needed; no tedious joint pouring is required; extensive inspections are eliminated; saves costly labor and materials on every installation.

And—Presto-SEAL is *not* an experimental process of limited availability in but a few sizes of pipe. In fact, thousands of miles of Presto-SEAL, in sizes from 4" to 36", both standard and extra strength, are providing large savings in both pumping and treatment plant costs everywhere. Approvals from public works officials, engineers and contractors are evidence of the preference-acceptance of Presto-SEAL clay pipe by KAUL.

Write today for complete particulars. Then, specify Presto-SEAL pipe for your next job!

*T.M. Reg.

KAUL clay company

TORONTO, OHIO ● U. S. A.

"Exclusive manufacturer of Presto-SEAL pipe that joints like magic"

harm done by collecting and accumulating the waters to flood particular areas to a greater extent than would otherwise have occurred. Since this was not shown, and there was no evidence that a nuisance existed, the city was held not to be liable in this case.

• • •

Engineering Management Conference

The eighth annual Engineering Management Conference will be held at the Morrison Hotel, Chicago, Sept. 15 and 16. The program is set up in four general parts: The Impinging Forces; New Requirements and New Aids; the Impact on Professional People; and the Impact on Education. Chairman of the Arrangements Committee is L.A. Spangler, Westinghouse Electric Corp., Merchandise Mart, Chicago. Registrations can be made through E.C. Rudolphy, U.S. Steel Corp., 3429 East 87th St., Chicago 17, Ill.

Oakland Bay Bridge Reunion

Those who worked on the Oakland Bay Bridge, California, back in 1936, are invited to a reunion on Oct. 28, in San Francisco. For more information write John L. Kergel, 3208 Claremont Ave., Berkeley 5, Calif., and send along a stamped envelope, with your address on it to be sure to get the details.

Equipment Used on Sanitary Landfills

"If you have a sanitary landfill what kind of equipment do you use in operation" was the question asked recently of city engineers, city managers and directors or superintendents of public works. A total of 825 answers were received. The totals below refer to replies, that is to the number of cities involved, and do not represent the total number of units in use.

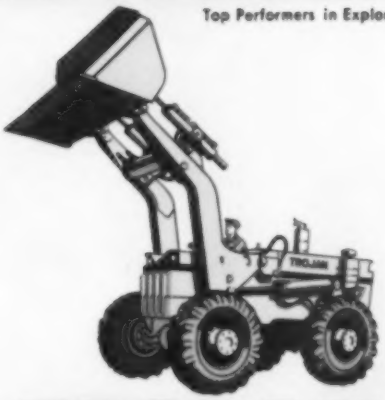
Crawler tractors were reported by 531 cities and wheel tractors by 54. Bulldozers were reported by 439 cities and bull-clam or 4 in 1 loaders by 97; however, there is some evidence that no accurate distinction was made in a number of cases between these units. Front-end loaders of the wheel type were reported by 35 cities and crawler loaders by 21; in some instances, names were used, but not in most cases. Other equipment reported included 19 draglines, 8 backhoes, 7 motor graders; and 8 carryall or other scrapers.

Top Performance

...a result of technical exploration

Whether at the poles or in the plant, exploration is the key to technical progress. So it is at Yale & Towne — where Trojan engineers design, develop and test materials and methods that make Trojan tractor shovels the Top Performers on thousands of jobs from busy local streets to barren foreign wastelands.

Top Performers in Exploration



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TRACTOR SHOVELS
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TROJAN TRACTOR SHOVELS ARE AVAILABLE IN 8 MODELS, LIFTING CAPACITIES FROM 6,000 TO 24,000 LBS.

THE **YALE & TOWNE** MANUFACTURING COMPANY

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"SADDLES ARE FOR HORSES"

...not American Cast Iron Pipe!

Too often the first cost of the material is the only factor considered when deciding between cast iron pipe or a substitute. To give sole thought to the cheaper substitute piping is, in a sense, false economy because many times this lower initial cost is misleading and obscures added expenses which must be incurred later.

Yes, the first cost may be cheaper... but cast iron pipe offers so much more.

Consider tapping. For reliable, economical water service, the tapped main must meet four definite requirements: (1) Have strength to withstand tapping operation; (2) Be of an *easily* tapped material which will assure *uniform* threads; (3) Have strength after being tapped to withstand service conditions; (4) Have threads that will provide tight connections after exposure to service stresses. *Cast iron pipe meets all of these tapping requirements.*

When tapping substitute piping, it is often necessary . . . to employ skilled workmen with special equipment . . . to utilize tapping saddles . . . to use extreme care in order to make a connection that does not leak.

Remember . . . tapping saddles are an extra expense and are *not necessary to make service connections to cast iron pipe.*

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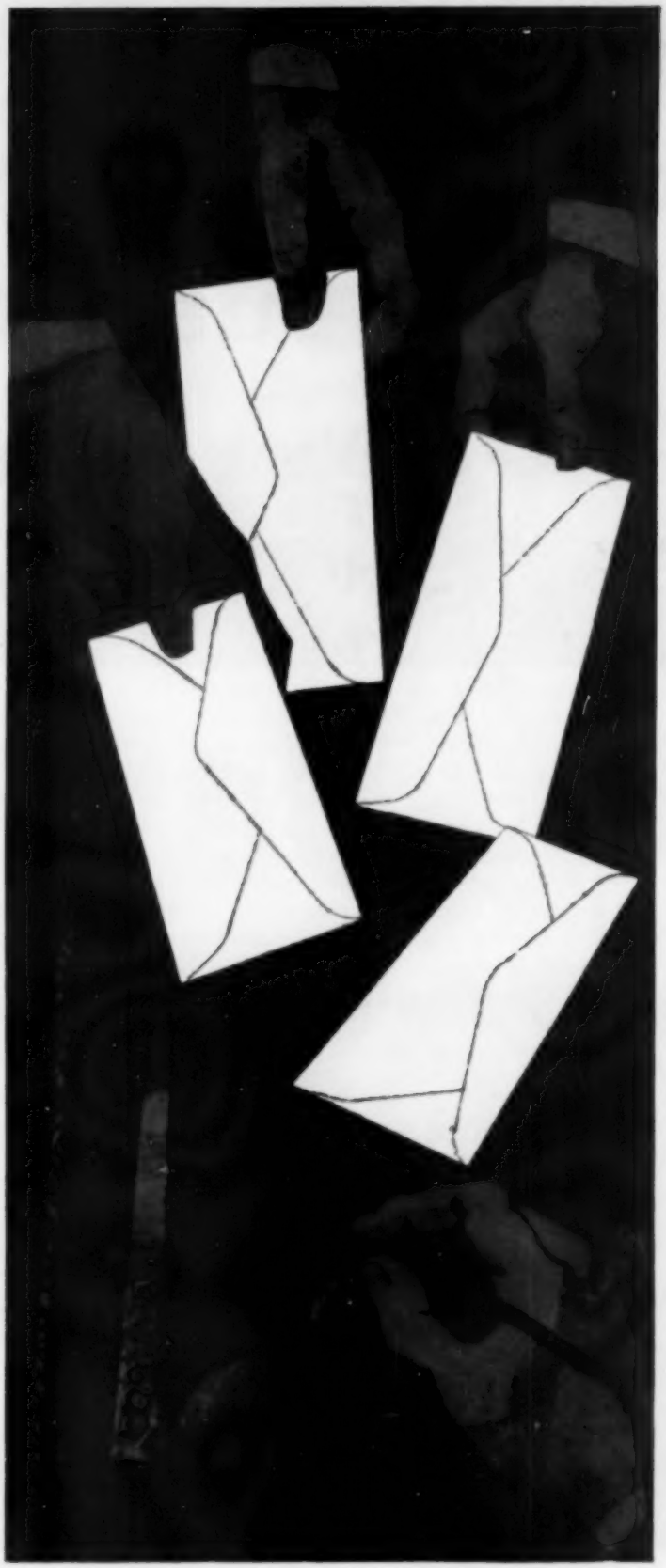

How to be sure you make the right choice after the Rock Salt bids are in

FIRST consider the company behind the product. What is its reputation, who does it serve, what are its resources? In terms of reputation, service and resources, the Morton Salt Company is the leader in the industrial salt field. Morton's outstanding reputation has been built on years of service to industries and municipalities throughout the United States. Now Morton, America's only nationwide salt company, can offer rock salt for ice control to users everywhere in the country from conveniently located salt sources and warehouses. And Morton numbers among its rock salt customers hundreds of towns and cities and many of the nation's counties, states and toll roads.

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NOW make your purchasing decision. Base it on your evaluation of the company, its record and its ability to serve you. When you decide on Morton you can rest assured that you have made the wisest choice. You can depend on Morton to give you dependable prompt service on the rock salt you need, when you need it.

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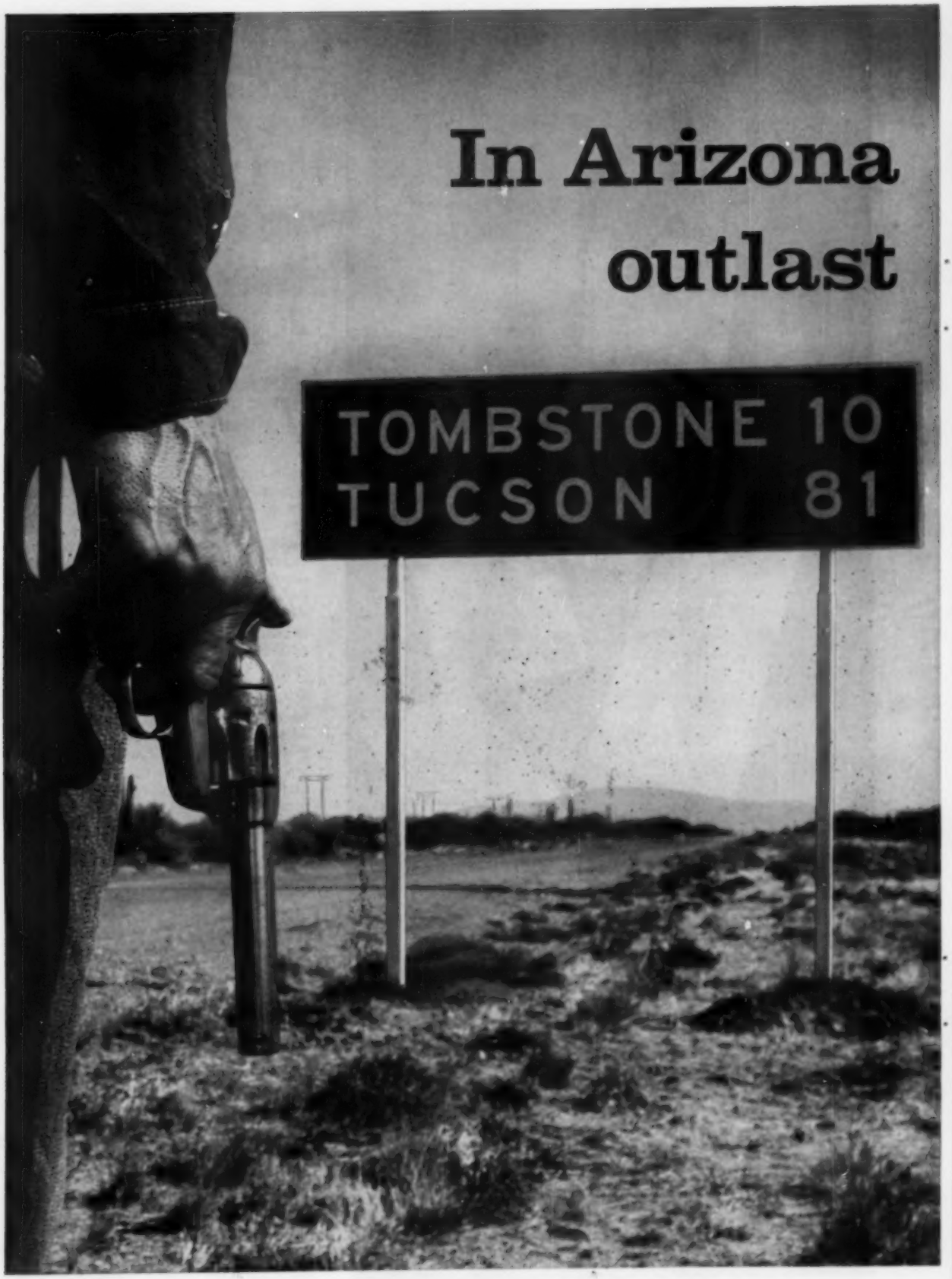
In Arizona
outlast
TOMBSTONE 10
TUCSON 81

overlaid plywood signs metal 3 to 1

SIGN REPLACEMENT WAS A REAL PROBLEM IN ARIZONA until the Highway Department switched to plywood. Trigger-happy motorists had been taking pot shots at metal signs. This led to rust, deterioration and often dangerously reduced legibility after only a few months of use. Then performance tests showed overlaid plywood's life expectancy was at least three times that of metal.

Now Arizona uses overlaid plywood for 85% of its signs. Vandals still shoot at them. But plywood stands up to both deliberate and accidental abuse without losing legibility. Bullets go right through without shattering the sign face. There's no corrosion problem; repairs are made quickly.

Overlaid plywood withstands Arizona's weather, too, with its extremes of heat, rain and snow. The plywood is completely waterproof, and the smooth, durable plastic-like surface makes an ideal base for reflectorized material.

Besides saving on maintenance and replacement, plywood signs are simple and inexpensive to fabricate. In Arizona's sign shop, a production-line process is used to make about 70 different basic signs, most with reflectorized legends.

FOR MORE INFORMATION (detailed specifications, application data, etc.) write:

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DFPA TESTED QUALITY

Plywood signs on Arizona's highways not only resist abuse from vandals and a rugged climate, but are attractive and easy to read. Fabrication in the state's sign shops is simplified because standard-sized panels of plywood are easy to store and easy to cut to required sizes and shapes. Above, reflectorized letters are applied to an overlaid plywood sign.

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This is the easy way to protect people and property

USS Cyclone Steel Fence is the simple solution for safeguarding lives and property in a public place. It protects children from traffic, stands pat against thieves, vandals and trespassers . . . and seldom succumbs to attacks of wind, fire or corrosion. It is extremely difficult to get through the fence or *over* it. And Cyclone Gates have a precise locking device that discourages unwanted entries.

USS Cyclone Steel Fence provides efficient, 24-hour protection at a reasonable cost for schools, parks, and all kinds of municipal projects. Write us today for details and complete specifications. American Steel & Wire, 614 Superior Avenue, N.W., Cleveland 13, Ohio.

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Try it . . . Prove to yourself how easy this valve will open and close. The Teflon coated straight plug turns easy even after prolonged idleness.

The Key to the dependable long-life performance of the Oriseal is in its simple, practical design. The entire valve assembly is only six parts . . . the three "O" rings in the sturdy valve body, the Teflon coated straight plug . . . the valve cap.

We are happy to offer the Oriseal as another beneficial product developed for the Water Industry . . . the direct result of over a century of experience and tradition for quality "craftsmanship". See your Mueller representative or write Dept. B, Mueller Co., for your copy of "The Oriseal Valve —Test Results".

The Oriseal turns easy without grease . . . has no mechanical seating device to wear or cause sticking . . . the seat is protected against damage and erosion.

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Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario.

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The **ALTITE JOINT**® has been subjected to a series of rigid tests much more severe than are encountered under the most extreme installation and service conditions in the field. Even under extreme conditions, this joint is so simple to install—you could hardly go wrong if you tried.

For Efficiency, Economy and Simplicity—

Insert Rubber gasket in bell end of pipe — you can't put it in wrong — A child can do it.

Wipe on a small amount of special lubricant—This reduces friction.

Insert plain beveled end of pipe — there are no grooves, ridges or tips on gasket to interfere with smooth insertion.

Small amount of pressure required to force plain end to bottom of socket—Your simple, time saving joint is completed.

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Ed Cleary Says:

GLOBAL WATER SUPPLY

EDWARD J. CLEARY

Diplomate, American Academy of Sanitary Engineering

Cincinnati, Ohio

WHEN THE Inter-American Association of Sanitary Engineering (AIDIS) meets in Montevideo, Uruguay next month (October 2-9) for its bienniel Congress, it will have an opportunity to review and lend its influence to the global water supply program being sponsored by the World Health Organization, and the International Cooperation Administration.

The program stems from a resolution adopted by the World Health Organization (WHO) in 1959. It recognized that development of community water supplies throughout all countries of the world, and notably in the developing regions, was a cornerstone not only of public-health advancement but of economic progress as well.

As recalled by Dr. Abel Wolman in a recent statement before a panel of consultants evaluating Latin-American conditions, there was only one dissenting vote to the WHO resolution. Said he: "This dissenting vote was registered because the resolution included, aside from the pious declaration which we have always passed that good water facilities are desirable, a significant new ingredient. It said that those responsible for the programming should concern themselves with methods of financing and management. The dissenter—incidentally a medical officer of high distinction—objected to the World Health Organization interesting itself in money, and secondly, in administration".

The point is, of course, that the drafters of the resolution had no illusions of where the difficulties lay in practical implementation of a program of this scope. This sophisticated view is now being amply documented by the findings of experts who have been studying the reasons why so many areas in the world are lacking in community water services.

Situation in Latin America

The Latin-American findings of the International Cooperation Administration (ICA) are most instructive. They were developed in cooperation with the WHO staff and the regional office of the WHO in the Americas, namely, the Pan-American Health Organization.

Among the conditions cited as handicapping the advancement of community water supplies were these:

1) The widespread concept that water is free and that some level of government should furnish service at little or no cost to the consumer. This philosophy is held not only by those who need water, but it is shared in varying degrees by many governments. Yet, almost without exception, electric light and power services throughout the world are operated on the basis of selling a commodity. And a much larger number of people in the less-developed areas has installed electric installations than water services.

2) The incomes of the vast majority of the people

Saskatoon Tunnels With Armco Liner Plate... Avoids Traffic Tie-Up on Street

New steels are born at Armco

When Saskatoon, Canada, decided to install a 72-inch storm sewer on a major thoroughfare last year, both open-cut and tunneling methods of excavation were considered. Because of the expense and inconvenience involved in closing the much-traveled street for an open-cut installation, the city elected to tunnel with rugged Armco Tunnel Liner Plate.

A vertical shaft 25 feet deep was dug and tunneling proceeded without interruption to traffic on the street above. Installation was accomplished at the rate of 13 feet per day. The entire operation was carried out smoothly.

Armco Liner Plates fill all requirements for tunneling in a multitude of municipal applications. Write us today for complete details. Armco Drainage & Metal Products, Inc., 7420 Curtis Street, Middletown, Ohio.

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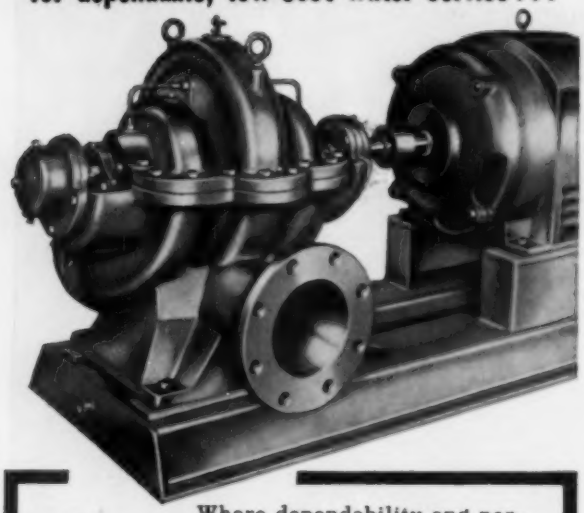
WEINMAN PUMPS

for dependable, low-cost water service...



Where dependability and performance count most—at critical pumping stages of water movement—you'll find Weinman Pumps. There's good reason for it, too. Weinman Split-Case Centrifugal Pumps are precision built to function continuously at top efficiency, with little or no maintenance. The horizontally split casing speeds routine maintenance and increases the "in-service" time of Weinman Pumps. Rotating parts are quickly inspected and easily removed or replaced without disturbing connections or driver. And, the rugged construction of Weinman Pumps stands up under the grueling punishment of 'round-the-clock operation. Municipal engineers and taxpayers alike benefit from the real economy of Weinman's dependable year-in, year-out trouble-free on-line service.

And, you get the same uninterrupted, dependable service from Weinman's outstanding line of Sewage Ejectors for the swift handling of liquids of varying viscosities carrying all types of foreign matter in suspension.

Write today for full information on all Weinman Centrifugal Pumps and for the competent, on-the-job assistance of your local Weinman Specialist, check the Yellow Pages.

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are very low and hence ability to pay for service is limited. But this condition hardly justifies the failure in many places to make little or no attempt to collect what revenues they can. In general, delinquent accounts are high, with no provision for collection or no effort to collect back accounts. Obviously, this deficiency in basic administrative practice needs correction in order to look forward to a self-supporting utility. And such loose practice hardly generates confidence among lending institutions when it comes time to float bonds for improvement of water systems.

3) Where construction funds for water supply are allotted to a community from national or state treasuries, no provisions are made for operation or maintenance. Since revenue from users generally is insufficient for such purposes the facilities installed for water service fall short of expected performance, or they rapidly deteriorate.

4) There is lack of comprehensive planning for the orderly implementation of nation-wide programs. And because of divided responsibilities for various aspects of water-supply development, this has resulted in wasteful and overlapping competition among agencies. When appropriations are made to individual municipalities more often than not they represent concessions to immediate political pressures. Since it is not the practice to earmark special taxes or other revenues, there is seldom any assurance of continuing a program to its logical conclusion.

5) Waterworks projects are in a highly competitive position with other necessary public-works projects at all levels of government. Since total budgets are quite limited in terms of overall needs, and since there is only a limited appreciation of the social and economic values of water supplies, this type of improvement does not attain the priority status it deserves.

6) Construction costs, despite the availability of cheap labor, are quite high. This is due to cost of materials, equipment and supplies, much of which must be imported, use of hand labor and general inefficiency.

7) Money available for loans from private sources is limited in amount, and the interest rates are very high. Little, if any, foreign private capital has been available for water supply loans.

An Estimate of Needs and Money

These are some of the reasons why the installation of community water supplies has fallen far short of the needs in many Latin-American countries. It has been estimated that as much as 40 percent of the urban population of 75 million people are *without* water service.

An approximation of probable construction costs to fulfill the objective of providing each urban resident with piped water service by 1970 would be about 200 million dollars.

Incidentally, it is pointed out that these construction costs for a single continent are only minor fractions of the global water supply needs of developing countries especially in Asia.

It is within this framework of reference that the sanitary engineer is now invited to orient his thinking. It is a happy circumstance, therefore, that engineers of South, Central and North America should be meeting in Montevideo next month to discuss these matters. From this meeting could come strong leadership in implementing global water-program objectives.

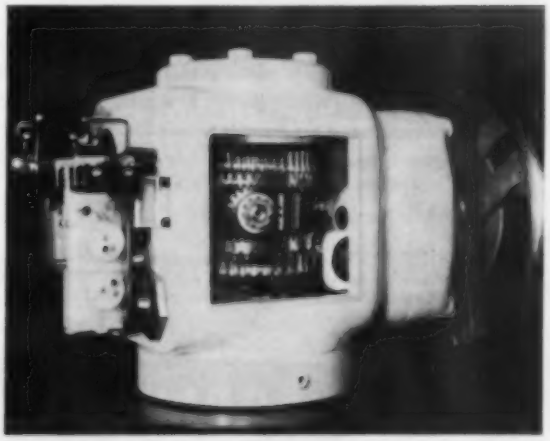
5 SOUND REASONS FOR SPECIFYING PELTON VALVE OPERATORS

Two Pelton Valve Operators afford remote control of gate valves in typical waterworks installation

1. **No clutch—uses planetary gear system**
2. **Torque protection in both directions—provided as standard at no extra cost**
3. **Easily accessible, easily adjustable nylon limit switch, which is noncorroding and durable and offers no lubrication problem**
4. **Flush-mounted limit switch compartment**
5. **Aluminum cover on limit switch compartment reduces weight for easier handling**

The Pelton Valve Operator may be used with a variety of valve types and is adaptable to a completely automated system as well as a simple pushbutton control. At present three motorized drive models of outstanding dependability provide up to 35,000 lb. of thrust for lifting requirements and as much as 6600 in.-lb. of torque. Larger sizes can be built to fill specific requirements. Widely used in filter, water and sewage plants, the Pelton Valve Operator is now also available in explosion-proof cases for oil and gas line application.

For further information, write Pelton Division (B-L-H), 2929 Nineteenth Street, San Francisco 10, Calif., or B-L-H Corporation, Philadelphia 42, Pa.



Closeup of operator with cover removed shows clean assembly of differential gearing and limit switches

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Asplundh Chippers are rugged, absolutely safe, are engineered for continuous, trouble-free service. They chip faster than any other chipper in the world; are easily maintained, simple in design, require less labor and materials cost.

New 1960 features include:

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Insecticide Resistance of Mosquitoes

Experimental work by the Communicable Disease Center of the Public Health Service, Savannah, Ga., on insecticide resistance of mosquitoes to various chemicals has been reported in the Proceedings of the New Jersey Mosquito Control Ass'n.

Measurements made on the larvae and adults of a strain of *Aedes aegypti* from the island of Trinidad showed a high degree of DDT-resistance in both stages. A concentration of 4 ppm DDT from acetone solution formulation was required for 50 percent mortality in contrast to .004 ppm DDT for a susceptible strain. Differences in larvicidal formulations were shown in work at Trinidad where 30 ppm DDT from a suspension and 9 ppm DDT from a xylene emulsion were required for 50 percent mortality of the Trinidad strain. Resistance to DDD was also demonstrated; but the strain was still susceptible to Strobane, malathion, dieldrin, and BHC. Combinations of DDT and DMC showed additive rather than synergistic insecticidal action, and combinations of at least 9 ppm of the chemicals were needed for complete mortality. Adults were resistant to residual deposits of DDT, and of DDT-DMC but showed susceptibility to deposits of malathion. Diazinon, and dieldrin. Without DDT selection the strain showed reversion toward susceptibility in about 18 months but larval selection with DDT subsequently increased the resistance level.

A second strain from Cucuta, Colombia showed even higher DDT resistance in the larvae since 2.5 ppm DDT produced only 17 percent mortality. This strain was susceptible to BHC and malathion, and showed only slight resistance to dieldrin in comparisons with larvae of a susceptible strain. Although the larvae have shown some loss of resistance in the absence of DDT selection, the adults have remained highly resistant to DDT.

Lighting On The New England Thruway

Lighting equipment for the section of the New England Thruway between the New York City line and the Connecticut border is being supplied by the Westinghouse Electric Corporation. The order includes 170 underpass luminaires; 20 poles of mercury floodlighting for interchanges; and 1040 luminaires with mercury lamps to provide illumination for the 11-mile section of highway. The units were purchased from Westinghouse through the Windsor Electric Supply Company of White Plains, New York. The Port Chester Electrical Construction Corporation of Port Chester, New York, is installing the units.

Equipment for a County

During 1959, equipment costing $127,900 was delivered to Hennepin Co., Minn. This included 6 pick-up and panel trucks; a tandem axle dump truck, 10-yd., with snow wings; 8 material and chemical spreaders; 2 pneumatic rollers; 3 power mowers; 2 chain saws; 2 motor graders with wings; an asphalt-heating-pumping unit; a bituminous distributor; a heavy duty shovel loader; a fork lift truck; and flares and warning lights.

Cost of Supplying Water

The cost of supplying water in Taunton, Mass., in 1959, was $128.15 per million gallons of which $16.56 represented interest charges. An average of 647 gpd was supplied to each tap.

The new incinerator at Whitemarsh. Note the neat compact lines of the building and the low stacks of the wet scrubbers which emit a plume of steam. Glace & Glace, Inc. were consulting engineers for the project.

new method lowers refuse disposal costs—gives communities

smoke-free, odorless, economical incineration

Communities across the country have experimented with various methods of refuse disposal. Their experiences amount to a test-in-actual-use of practically every approach to the problem. Today, backed by cost, convenience and long range land use considerations, many have gone to incineration as the best solution. This is especially true since a new type of incinerator now brings costs into line with most community budgets.

This new type of incinerator was adopted by Dravo Corporation after intensive research into the refuse and sludge disposal problems of communities of all sizes. The Dravo Incinerator provides almost completely automatic operation and reduces the number of operators required. It takes full advantage of the latest materials handling techniques to eliminate litter. It utilizes modern combustion principles to eliminate smoke and odor. Each part of the system has been selected for rugged construction and ability to contribute to overall efficiency. Two of the most important parts are the storage conveyor and the furnace.

Water-cooled furnace during construction. The cooling pipes can be seen between the courses of refractory brick. Oil burners are used for ignition only; no additional fuel is needed to support combustion of refuse.

THE STORAGE CONVEYOR. Trucks are dumped indoors so that trash will not be scattered around the area. Refuse falls through an opening in the floor directly into the conveyor hoppers. The hoppers oscillate mechanically, throwing the material forward. This action is self-scouring and refuse does not stick to the sides or bottom of the hopper.

The refuse empties into feeders which charge it into the furnace. Automatically operated on a controlled time cycle, the feeders lock a layer of refuse against the furnace gates. This maintains an effective seal, permitting good control of furnace draft.

THE WATER-COOLED FURNACE. The furnace is constructed of first quality fire brick in which water filled cooling pipes are embedded on 8-inch centers. The cooling pipes maintain furnace wall temperatures below the slagging point of the refuse ash. This construction permits intermittent operation without the need for a long cooling period. In addition, the walls are thinner, and refractory maintenance is reduced to a minimum. The higher combustion temperatures made possible by water cooling improves burning rate and eliminates noxious odors.

Partially loaded hopper. Walls and floor are kept clean by the oscillating action. The hoppers are mounted on air springs, which compensate automatically for the load in the conveyor.

The Dravo Incinerator is the economical solution to the problem of sanitary, convenient refuse disposal. For full information, write or call DRAVO CORPORATION, PITTSBURGH 22, PENNSYLVANIA.

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This is the first long-term roof guarantee ever offered for pre-engineered buildings. It is made possible by Butler's leadership in designing and fabricating an enduring, weatherproof aluminum roof system that today has an impressive history of outstanding job performance on thousands of Butler buildings. Be sure that this new development in roof security, optional at nominal extra cost, is considered in your new building plans.

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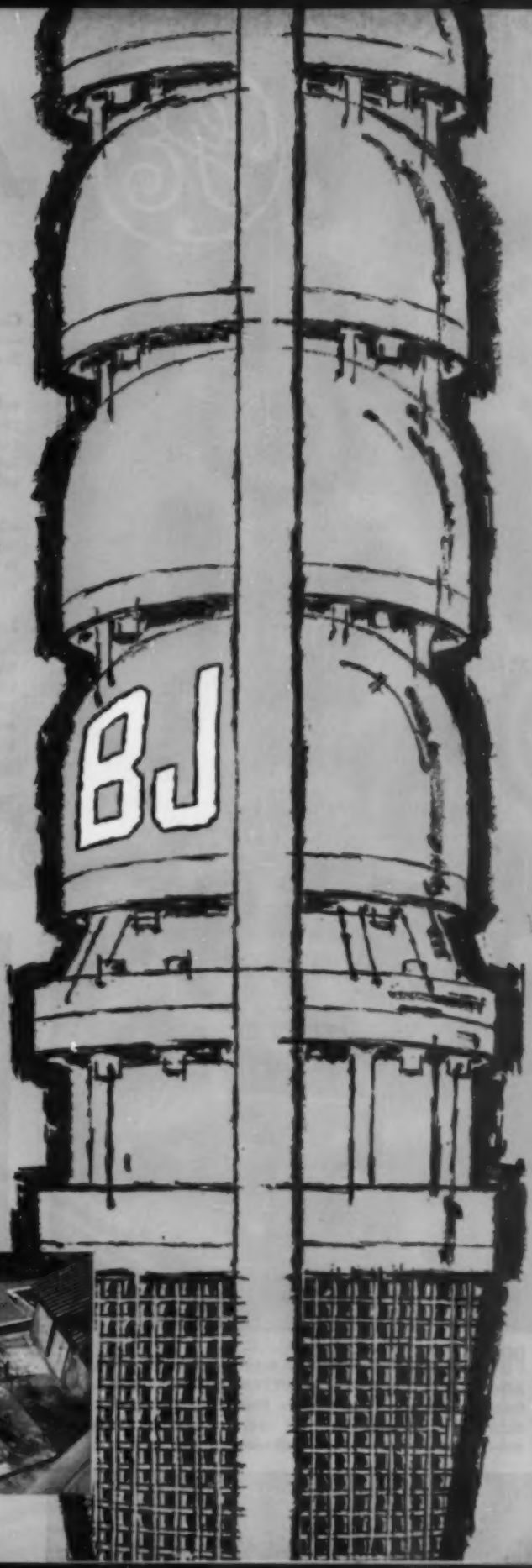
Quality *costs less* in the long run!



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Nowhere is quality more important than in a submersible pump installation where both pump and motor operate down-hole. And that's where BJ quality pays off!

Sealed for life, no adjustments or routine maintenance is required...no noise, no pump house needed, and there is no danger of vandalism or contamination of the well.

As a pioneer in submersible pumps since 1928, BJ manufactures all three basic components—pump, motor and seal—and offers complete unit responsibility with *the* quality submersible pump. Available in capacities from 20 to 20,000 GPM, heads to 1,800 feet and motors to 450 HP.

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more light per dollar on America's roadways

you are interested in solving. These systems have met the test of customer evaluation in terms of cost of light, and over-all operating and maintenance economy ... *your best guarantee of a modern lighting installation.*

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With *PREFERRED LIGHTING*, you can reduce your inventory investment. Much of your warehousing and inventory expense is borne by General Electric.

A simplified product line, pre-designed lighting systems and layouts, and the ability to order from a single source mean you can order most lighting equipment by phone. What's more, in most cases you can expect to have your equipment at the installation site within one to three days of your order!

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By following "customer-approved" *PREFERRED LIGHTING* recommendations, you save the time and expense of individual lighting layouts and calculations. Factors such as distribution patterns, spacings, mounting heights, and maintenance factors are already worked out in advance. Just select the type of lamp and the footcandle level you desire.

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Get your *PREFERRED LIGHTING* Designer's and Buyer's Guide, today! Use it as a basis for a thorough evaluation of your present buying practices, in comparison with the benefits offered by General Electric's *PREFERRED LIGHTING* approach. Your G-E Apparatus Sales Engineer or Agent will be happy to help. General Electric Company, Outdoor Lighting Dept., Hendersonville, N. C.

Progress Is Our Most Important Product

GENERAL ELECTRIC

EASY APPLICATION saves you the time and expense of designing individual layouts, and considering distribution patterns, spacing, mounting heights, and maintenance factors. Selection of *PREFERRED LIGHTING* equipment is a simple matter of deciding on source and footcandle level.

New PREFERRED LIGHTING Guide

General Electric Company
Section H460-02
Schenectady 5, New York

Please send me a copy of the new General Electric *PREFERRED LIGHTING* Designer's and Buyer's Guide, GEA-7100, with descriptive, application, and ordering data on the complete line.

Name _____

Company _____

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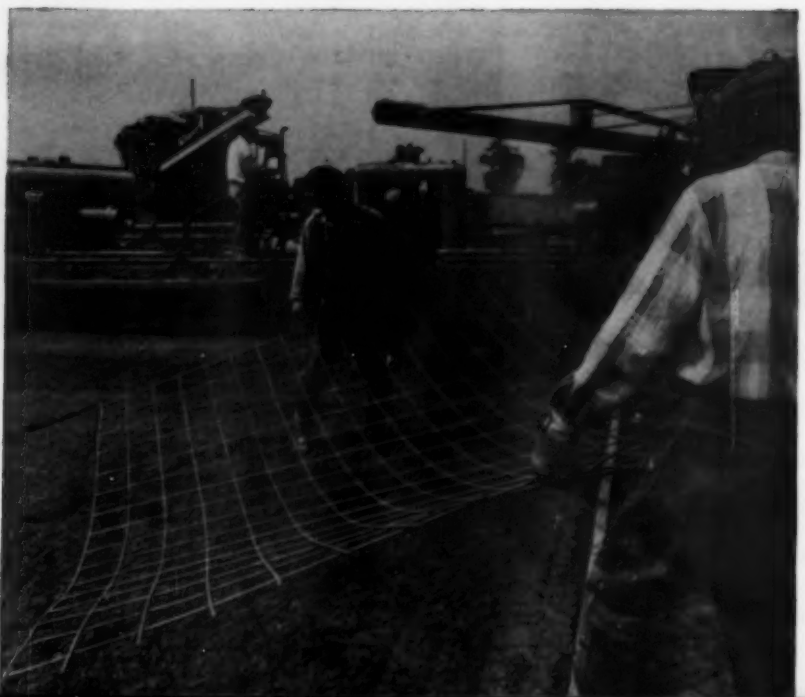
Steel reinforced ...to stand up



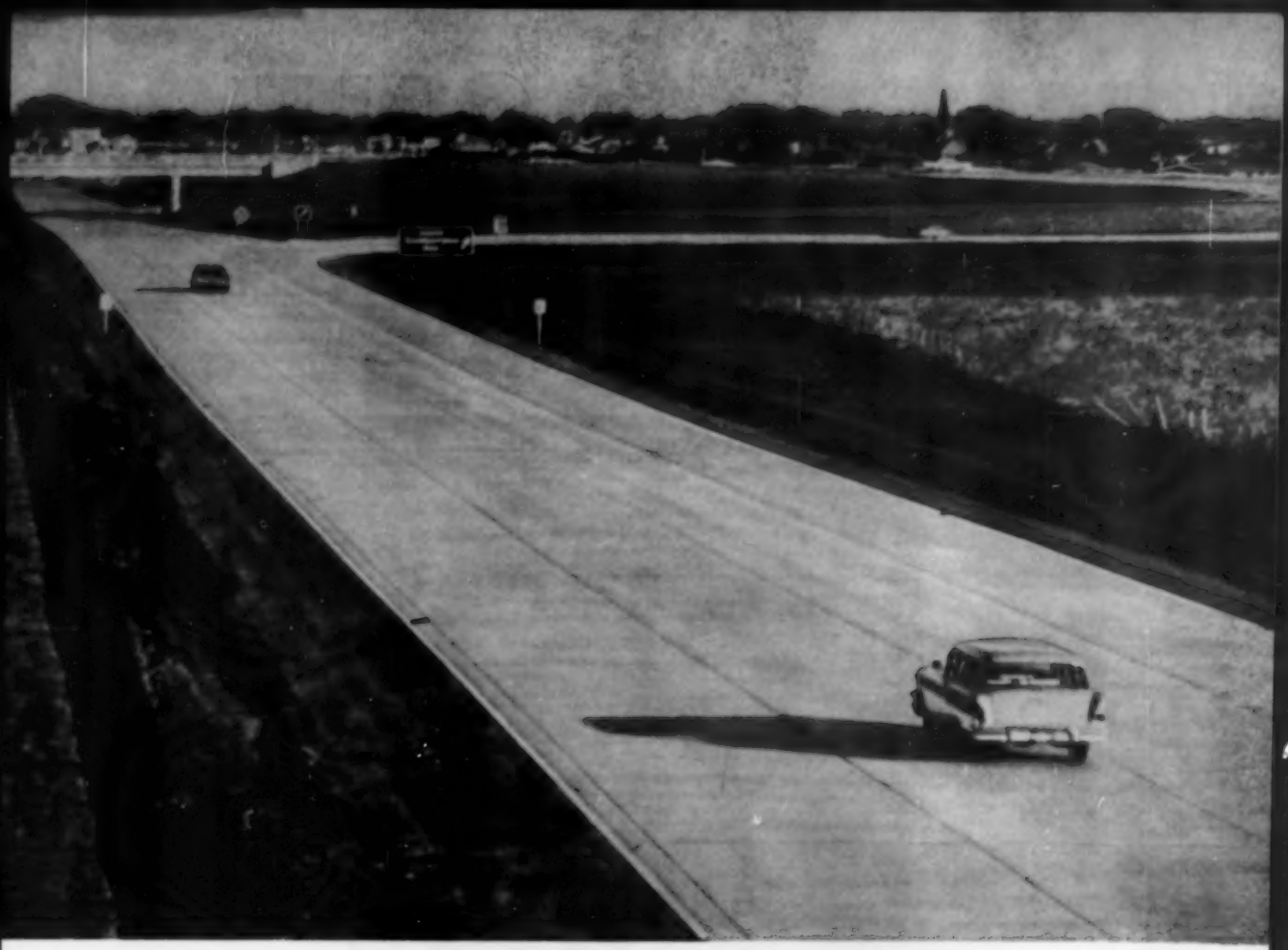
PROJECT: Portion of Northwest Expressway just west of Cumberland Avenue Interchange, Cook County, Illinois

OWNER: Cook County Department of Highways

CONTRACTORS: Arcole Midwest Corp., Evanston, Illinois

WIRE FABRIC DISTRIBUTOR: E. W. Zimmerman, Inc., Chicago, Illinois

This mark tells you
a product is made of modern,
dependable Steel.



under the hi-speed pounding of modern traffic

Cook County, Illinois has opened the first section of its new Northwest Expressway. And, like other expressways built under the authority and supervision of that county's Department of Highways, it is steel reinforced.

An anticipated daily count of 31,000 vehicles is expected on this newly opened 4½-mile section which extends from Foster & Central Avenues to the Illinois Toll Highway. This figure indicates what this already busy strip will be subjected to as the traffic load gets heavier. And it points up the importance of building into all new roads and highways the strength it will take to stand up under the almost ceaseless pounding of modern hi-speed traffic in the years ahead.

Highways reinforced with steel have a balanced design in that all edges and corners are fully protected. USS American Welded Wire Fabric accomplishes distributed load transfer and reduces stresses about 30% which accounts for the truly superior performance of reinforced concrete over non-reinforced concrete. Reinforced pavements provide a safe, smooth riding surface that lasts.

USS American Welded Wire Fabric is today stronger than ever. Minimum tensile strength is now 75,000 psi and minimum yield point is now 60,000 psi. It has reserve strength for heavier pounding and it is available in a completely machine fabricated form, ready for immediate placement. For more information, write to American Steel & Wire, 614 Superior Avenue, N. W., Cleveland 13, Ohio. *USS and American are registered trademarks*

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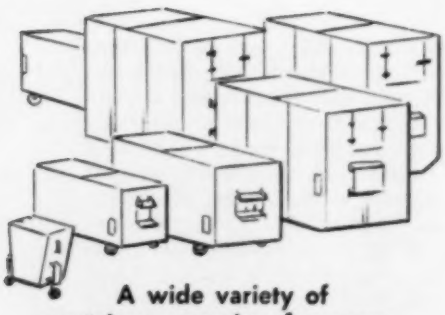
United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
United States Steel Export Company, Distributors Abroad

TWO SYSTEMS IN ONE WITH *No. 1 Containerization...*

... In Commercial Areas and at Bulk Accumulation Points

Here's the low-cost way to provide the convenience and cleanliness of enclosed, containerized refuse storage in commercial districts . . . while you cut collection costs to the bone. The one-man DEMPSTER-DUMPMASTER handles one-half through eight cu. yd. containers, and makes quick work of downtown and shopping center collection routes . . . handling hundreds of yards of refuse in a day.



A wide variety of containers, ranging from one-half through eight cu. yd. capacity, is available as standard equipment.

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DEMPSTER DUMPMASTER® SYSTEMS

DEMPSTER

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THE DUMPMASTER

No. 2 Manual Loading...

... Of Refuse and Trimmings in Residential Areas

As a hand-loaded packer, the Dumpmaster has no peer. The powerful 60,000-lb. hydraulic packer plate compacts big, economical payloads . . . handles brush, trimmings and large objects, as well as regular refuse. Loading into the low-front, manual-collection container is easier for the crews . . . safer, too, since they're always out in front in the driver's view. Investigate the Dumpmaster . . . the world's most versatile mechanized refuse collection system.

Safe, In-Front, Low-Level Loading

High Density Compaction Gives Bigger Payloads

Brochure

B R O T H E R S

Dept. PW-9 KNOXVILLE 17, TENN.

DEMPSTER DUMPMASTER® SYSTEMS

MORE NEW TRAXCAVATORS

THE 2¾ yd. 966

THE 1¼ yd. 922

NOW THREE WHEEL LOADERS...BIG IN EXPERIENCE

Now there's a Caterpillar wheel loader for your job—the new *2¾ yd., 140 HP 966* for high production where you measure time in tons loaded—the *2 yd., 105 HP 944* introduced this spring and already gaining an acceptance unmatched in machine history—the new *1¼ yd., 80 HP 922* with the big machine operating and safety features that give it the speed and versatility to handle all those jump-and-run jobs.

There's a seven-year history of testing, torturing and working these Traxcavators . . . proving every component, every feature. They've been on tough jobs all over the country with field engineers watching every cycle, recording every strain.

Now Caterpillar's full line of wheel loaders is proved and ready for work—ready without compromise. They'll fulfill all your expectations of the most advanced wheel loaders on the market today.

See the one man with all the facts on the new Traxcavators—your Caterpillar Dealer. He can give you the full story on the wheel loaders that are brand new in features.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

The 966 and 922 have all these features introduced by the 944:

Cat Diesel Engines – Turbocharged for efficiency and quick acceleration.
Optional gasoline engines for the 922 and 944.

Cat Power Shift Transmission – gives instant shifting, forward and reverse, 1st and 2nd speeds. High and low range selector also provides two-wheel drive for roading, four-wheel drive for power and traction in work cycles.

Operator Safety – Lift arms and cylinders are forward of the operator and cockpit. Visibility is excellent and access is easy . . . up three wide steps.

Long Reach – With the lift arms up front, the dumping reach of the new Traxcavators is impressive: 57" on the 966, 51" on the 944 and 41" on the 922.

Operator Conveniences – Bucket controls have automatic positioners to speed every cycle; machine controls are all power boosted for easy operation. Dual brakes give operator choice of braking with or without transmission engagement.

Full Line of Attachments – Special material buckets, side dump buckets, forks, cabs, etc.

CATERPILLAR

Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

TRAXCAVATORS ARE MAKING OTHER LOADERS OBSOLETE

SEPTEMBER, 1969 PUBLIC WORKS MAGAZINE Volume 91, Number 9

THE SCIENCE OF WINTER MAINTENANCE

The year around travel demands on our streets and highways, the ever-present budget limitations in an economy of rising costs, and the continuing developments in materials, equipment and procedures have today made snow and ice control an engineering science rather than a casual hit-or-miss winter nuisance to maintenance organizations. Transportation on our streets and highways has become such an integral part of our modern economy that delays and stoppages caused by snow or ice cannot be permitted. Air transportation too is dependent on the ready availability of taxiways and runways where snow and ice control must be met with the same skill required on our highways. Costs of an effective snow and ice control program are high in our northern states but the cost of an ineffective program is much higher—and the price often times is paid in part in human lives. Progressive maintenance organizations are today recognizing snow and ice control as an engineering problem requiring the same analytical evaluation of manpower, equipment and materials; the same deliberate planning and preparation with which any engineering problem is attacked. In this issue, sound engineering practices are presented by representative state, county, city and toll road officials who have the physical safety and economic health of our nation's roadway transportation as their responsibility.

● **NO JOB for an amateur is the operation of this front and wing-plow equipped motor grader cutting back massive windrow.**
Courtesy Allis-Chalmers Manufacturing Company

SNOW FIGHTERS OPERATE LIKE MILITARY FORCES

H. J. KEIL
District Engineer
Indiana State Highway Department
LaPorte, Indiana

HIGHWAY snow removal is the one peace-time operation most nearly similar to a military battle. The "enemy"—wind, snow and temperature—is just as relentless and unpredictable as any enemy could be. As in a military operation, the principal elements are: 1) Planning; 2) manpower; 3) materiel; and 4) communication.

Planning consists, first, of a willingness to accept the fact that the snow of last winter was probably not the worst nor was it a freak condition that "just can't happen again." We must assume it *will* happen again and then proceed to plan for next winter while the recent problem is fresh in mind. We might still recall that trucks were too light, not enough plows, men not properly assigned to definite areas, no plans for replacement, inadequate facilities for equipment repair, no communication, or, above all, the lack of a favorable attitude on the part of personnel, particularly supervisory personnel. It may require considerable self-discipline to prepare specifications and budgets for snow removal equipment in mid-July while the mowing and resurfacing programs are driving us mad, but that is the time it must be done. Delivery alone on many items may require 90 days or more.

The manpower problem consists of organization and training; the training to have as its objective the development of a proper attitude in the minds of the men. The men must appreciate the significance of snow removal and, if the job is to be done properly, it must mean more than the swollen pay checks that are created by the large amount of overtime necessary. The men must be impressed with the responsibility that each accepts. For the most part, no boss can follow each truck out the gate. Once he leaves the yard, each man is entirely on his own and what he accomplishes is up to him. The big job for the supervisor is the maintenance of esprit de corps. Men become tired after many hours of exposure. At these times it is

● **WORKING** in deep snow drifted on a country road, this Allis-Chalmers 45 motor grader is equipped with a directional front snow plow and a rear mounted wing plow.

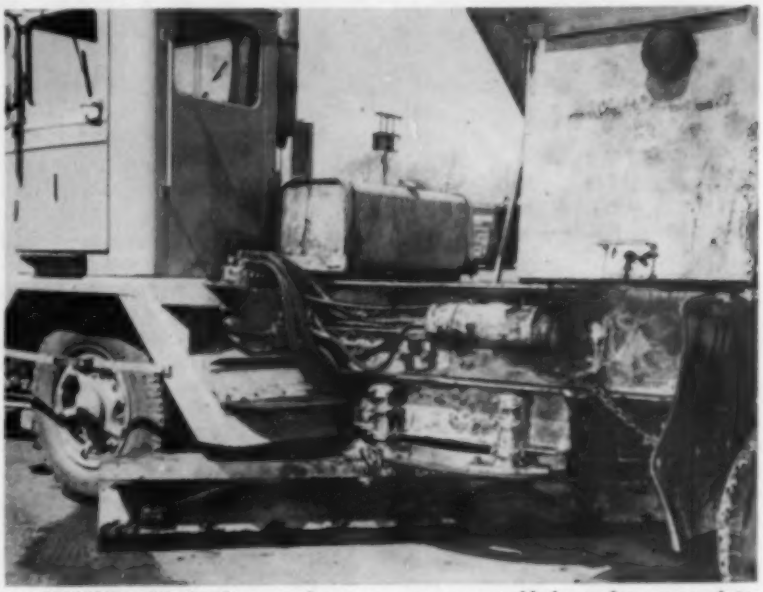
● **CONVERTED** U. S. Army surplus, a Hendrickson 50,000 GVW unit, has Gledhill reversible front plow, Baughman 11-cu. yd. body and Pneu-Hydro underbody snow blade.

natural for them to welcome an opportunity to return to the garage for some adjustment on their truck or for any other good reason that might give them an opportunity to get a little rest. When these things happen, the good supervisor won't argue about replacing the windshield wiper, adjusting the heater, checking the battery or the many other little things that can become irritating to the operator. He will instead, try to do something for the driver that he had not even asked for. Nerves and tempers are at a high pitch and it is not easy to be patient but it must be done.

Materiel consists mainly of adequate equipment, chemicals, abrasives, fuel, etc. Much could be written concerning specifications for snow movers but the subject can be simplified by a courageous approach to the matter of weight. The movers must have sufficient weight and power to move the snow that accumulates; first, on the level as it falls; and secondly, in the ridges that are formed by the initial plowing. It is in this second phase that we usually fail. The light patrol trucks soon form a ridge so high and heavy that they can no longer move it; a subsequent snow or high wind then quickly fills in the narrow, plowed trench and there is no place to go. The salvation is, of course, in heavier equipment to follow the patrol rigs and lay the snow back as far as right-of-way will permit—knock the ridges down to a minimum height to reduce the "snow fence" effect. It is at this point that our real problem begins —heavy equipment is expensive and usually finds little use at other periods of the year.

The Indiana State Highway Department this past winter acquired a number of 30,000 to 40,000-GVW military trucks that had been declared obsolete for military purposes. The cost of this equipment was very nominal and the trucks were equipped, without difficulty, with plows, underbody scrapers, and spreader boxes. Those men of this department who are charged with the immediate responsibility of snow removal, thank John Peters, Chairman of the Indiana Highway Commission, for his vision and effort in making this purchase possible; also thanks go to the Bureau of Public Roads for their important contribution.

Communication is the key to the successful handling of any emergency, whether it be snow storm, flood, tornado or other disaster. In spite of the importance of communication, we are most weak in this phase. Modern radio has been used successfully by contractors and other similar operations and such use has increased benefits to the user. Yet many highway departments are slow to face the fact that there is sufficient justification for radio communication. Such equipment should greatly increase the effectiveness of emergency operations.



● **COMPLEX of hydraulic controls necessary to operate blades under severe winter conditions is illustrated in this view of unit showing the underbody scraper blade.**

● **REAR VIEW of big unit shown on opposite page illustrating heavy bumper and spinner assembly. Note the spare cutting edges which are carried on the bumper frame.**

MINNEAPOLIS
SENDS SNOW DOWN THE RIVER

E. H. LUND
Superintendent of Street Maintenance
Office of the City Engineer
Minneapolis, Minnesota

SNOWPLOWING and removal in Minneapolis are conducted on a city-wide basis. The entire operation is based on a preconceived plan, with an established priority and sequence by which streets are plowed and equipment distributed to each of the City's five maintenance districts. The superintendent of streets is charged with the responsibility of determining when operations shall commence. He is in constant contact with the Weather Bureau for the first indication that there is a snowstorm pending and his decisions are largely influenced by the advice of the weatherman. The equipment division is also alerted when information is received that a snowstorm is on the way. The mechanics are assigned to the snow organization and equipment is immediately serviced. When the decision is made to start plowing, the dispatcher and his force, located in the central shop, immediately organize the crews. The City of Minneapolis carries on its construction work on a "Day Labor" or "Force Account" basis, and so it has a large reservoir of civil service labor to call upon for snow service. When the dispatcher calls, the men are directed to their specific work locations; truck drivers and equipment operators are given the code number and the location of the piece of equipment they are to operate. About three hours are required to get the organization out and plowing. Each snowplow operator reporting is given a cellophane-faced holder in which there is inserted a typewritten sheet of instructions listing the streets he is to plow, the order in which they are to be plowed and any special order or instructions which may apply to his particular assignment. The operator hangs these instructions in his cab and has them before him at all times.

For its fight with snow and ice, the City of Minneapolis has available 250 pieces of City-owned equipment, consisting of:

- 2 Rotary snowplows mounted on 4 wheel drive trucks.
- 1 Walters truck with 4 wheel drive equipped with under-body blade and with V snow plow.
- 8 Conveyor type snowloaders.
- 11 Wheel-type tractors equipped with 1½ cu. yd. snow buckets, or 4 only, equipped to be used as rotary snow loaders.
- 26 Motor Patrol graders with blades and 12 foot one-way snow plows.
- 2 Wheel tractors for the towing of automobiles from snow removal areas.
- 114 Trucks of 4 to 10 yd. capacity, equipped with one-way plows.
- 23 10 ton tandem dump trucks with 12 yard bodies for hauling snow.
- 8 Jeeps equipped with lifts for the removal of cars from snow removal areas, also equipped with one-way plows for removing snow from curb and sidewalk.
- 12 Catch basin steamers, 10 to 30 h.p. portable steam generators for thawing out catch basins and sewers.
- 12 Pickup trucks for supervisory personnel, some of which are equipped with radio telephone.
- 8 Crawler-type tractors equipped with bulldozers and loading buckets.
- 4 Tail gate salt spreaders.
- 11 Demountable sand and salt spreaders for dump trucks.
- 8 Mechanical Hopper type 5 cu. yd. sand and salt spreaders permanently mounted on trucks.

● **LOADING** *snow into a city truck for disposal. Motor grader scarifies ice and clears snow from near curb. This Bros rotary snow plow loads trucks in one minute.*

A typical snow removal unit assigned to the central business district consists of: A snow loader capable of loading 6 cu. yds. of snow in thirty seconds; three patrol graders for windrowing the snow; two Jeeps for plowing snow from the sidewalks and towing parked vehicles from the street; and eight to fifteen trucks, the number depending upon the length of haul and amount of snow. Personnel includes a foreman in charge, a checker to log the loads and six to eight laborers. Laborers are assigned, one to each Jeep, to assist in the towing of cars. The remainder remove snow from around street lights, meter posts and other sidewalk obstructions. Customarily, we operate up to four of these units in our central business district simultaneously. In our outlying business districts, the work is usually accomplished by an organization consisting of a wheel tractor equipped with a hydraulic bucket loader, two or three dump trucks, a flagman and three or four laborers. The work is done in the central business district at night, between the hours of 11 P.M. and 7 A.M. and in the outlying districts, during the day.

Recently, disposal of snow has become a serious problem. In earlier years, there were large tracts of vacant property which could be utilized as snow dumps. The City of Minneapolis has now grown to the extent that vacant properties are almost non-existent and there is no place to dump snow. Specially constructed openings in the street for snow disposal afford access to the storm sewer system but at the rate we are loading snow at the present time, this method of dumping is too slow. It is also dangerous in that it affords the possibility of men slipping into the sewer opening. In the present solution to our disposal problem, we barricade one of our Mississippi River bridges from 11 P.M. until 6 A.M. During that period, all the trucks from our central business district haul and dump their loads on the bridge. A large rotary plow stationed on the bridge, casts the snow from the bridge into the river. This has proven a very efficient, economical method of disposal.

We use a considerable amount of rock salt in preparing sand for spreading on the streets. When sand is spread for the purpose of alleviating slippery street conditions, we mix about one hundred pounds of salt with each cubic yard of sand.

● **SNOW IS dumped on bridge and blown into river for disposal. Here a truck dumps six cu. yds. of snow in front of Bros plow which will move 45 tons/minute.**

The rock salt aids in imbedding the sand in the ice. We use straight rock salt on the main arterial streets. This is spread with a spinner-type truck spreader. During working hours, when the sand pits are open, we haul most of the sand direct from the pits but we have four stockpiles throughout the City for use when the pits are closed. When sand is stockpiled, it is mixed with 100 pounds of rock salt to each cubic yard of sand. This keeps the pile from freezing and at the same time the salt becomes thoroughly mixed with the sand thus making it more effective when spread on the ice.

In connection with our snow plowing and snow removal operations, we post some of the streets where the snow is to be removed or plowed back to the curb. The purpose of the posting is to clear the streets of cars. Posting is accomplished by having the district supervisors submit a list of streets where sand is to be plowed or removed the next day. The list is filed with the Police Traffic Bureau, stating the hours covered by the signs, usually 8 A.M. to 4 P.M. for daytime work and 10 P.M. to 7 A.M. for night work. The police department notifies the towing companies so that they will be prepared to tow away cars that are tagged with a red tag by the police officers who begin their tagging at the appointed hour. Cars found tagged are hauled to the towing company's garage where they can be reclaimed by the owners after paying the charges and getting releases from the police department. In cases of heavy snow when removal is planned in the downtown area, the list of streets is phoned in to the daily papers. The papers then publish the list and the hours that parking is to be banned.

Minneapolis covers an area of approximately sixty square miles. After each snowstorm, a thousand miles of streets are plowed. There are 4,000 alleys (about 500 miles) which are also plowed when the snowfall exceeds 9 inches. Snow is loaded, hauled away and disposed of from the central business district and outlying community centers, aggregating about a hundred street miles.

● **ONE PASS of motor grader breaks up encrusted snow and leaves a uniform windrow away from the curb for pick up by rotary. Grader is Galion tandem, 4-wheel drive.**

SNOWFALL
is the Biggest Challenge of Airport Maintenance

DOUGLAS C. WOLFE
Airport Superintendent
Detroit Metropolitan Wayne County
Detroit, Michigan

WHILE there are many other administrative, safety, and operational expenses, maintenance is by far the most costly to the Airport Operator. The importance of good maintenance is recognized at the Detroit Metropolitan Wayne County Airport, today one of the modern jet airports in the United States. Square in shape and four square miles in area, the Airport has four runways of various lengths, the longest being 10,500 ft. All runways are 200-ft. wide and of concrete construction. They are designed to handle any commercial aircraft presently used by the air carriers. Included in the runway design is a complete taxiway system to serve all runways. Modern elevated lights are installed on all runways and taxiways. There is provision for installation of a narrow gauge lighting system on the instrument runway when a standard is established by the Federal Aviation Agency.

Late in 1958, the new Administration Building to serve those airlines moving from the Willow Run Airport was dedicated and opened to the people of Detroit. The responsibility for the maintenance and operation of the airport is given to the Airport Superintendent's office by the Wayne County Road Commission and administered by the Airport Manager, Joseph Gross and Assistant Airport Manager, James M. Davey. Inasmuch as the Airport is operating under a revenue bond ordinance, it is necessary that it be self sufficient. Maintenance costs and control are therefore extremely important to the Airport Operating Department.

The Maintenance Department consists of the following: A Maintenance Supervisor; Assistant Maintenance Supervisor; Building Foreman and 12 Maintenance Men; Electric Foreman and 3 Electricians; Field Foreman and 16 Maintenance Men; Automotive Foreman and 6 Mechanics; 7 Skilled Workers (Plumbers, carpenters, etc.); 2 Stock Room Men; and a Timekeeper. The payroll for the Maintenance Department is 45 percent of the total Airport payroll. Two buildings are used for the storage of maintenance equipment, stock, and locker rooms. The area is equivalent to 42,000 square feet.

There are located on the Airport grounds, 63 buildings for various requirements. The responsibility for all major and a portion of the minor building maintenance is that of the Maintenance Department. Bi-monthly inspections are made of all buildings and facilities and work orders issued for maintenance required. This procedure provides full information for the maintenance supervisor in setting up work schedules.

The problem of greatest concern to the Airport Maintenance Department is that of snow and ice control. It is necessary that snow be removed when it reaches 2-in. in depth. With jet operation, this critical depth may very well have to be reduced. Freezing rain and sleet need considerable attention, for an aircraft needs traction on its tires for taxiing as well as for control on landing. In 1958, over 2,000 tons of sand were used for ice control. An added problem is created by the airlines' reluctance to allow airports to use salt, even with an inhibitor, due to the possible corrosive action on the aircraft.

The plowing of snow from a runway is not a difficult or time-consuming problem; however, there is at the present time only one means available to move snow from inside the elevated lights to the outside. That is by the use of a snow blower and is a slow, time-consuming job. Intersections are also a problem due to the large area and volume of snow. The closing of both runways is often required while such clearing is being accomplished. A directional sno-blower is a very valuable piece of equipment for this type of clearing operation.

Taxiways are plowed to the center and then with one pass of the sno-blower, the entire taxiway can be cleared. Ramp areas at the Terminal Building are difficult for all snow must be carried by truck from the area. Snow removal constitutes the greatest single expense of the entire maintenance budget and better than 75 percent of the overtime paid by the Maintenance Department.

The Board of Wayne County Road Commissioners also operates all county parks. Through this association, the Airport is considered a park in relation to its physical appearance. Hundreds of thousands of visitors come to the Airport each

● **TRUCK tractor unit with new hopper type spreader for ice control by use of sand.**

● **OPERATIONS at a large modern airport may involve snow removal. Above is a Sno-Go rotary which is shown at work below.**

year and we attempt to keep it attractive. This program also requires a considerable number of man hours of maintenance work and a sizeable amount of expense each year. With the many skills required in our maintenance program, we are fortunate in having available from other county departments those talents not available within the maintenance staff.

To control properly the work to be accomplished, the Maintenance Supervisor must approve all work orders. He evaluates the extent of the work, the department to do the work and its priority. He approves orders and sends them to the foreman, who in turn requisitions materials and schedules the job. All time, materials, and equipment are charged against the job and the work order returned to the Maintenance Supervisor when completed. By this method, a constant record is available as to work in progress, work completed, and work pending. No work other than that authorized by work order, can be accomplished. This gives the Maintenance Supervisor complete control. Bimonthly inspections of all facilities are made by the Maintenance Supervisor or his representative. A standard inspection form is used which covers all facilities within an area. Upon completion of the inspection, work orders are issued for correction of the deficiencies found.

Because of the high cost and operational importance of maintenance, we are continuing to strive for top efficiency at the Detroit Metropolitan Wayne County Airport.

Wayne County Airport Major Equipment List

3 Walters 4-Wheel Drive Trucks, Model AGBS with Roto-Wing attachment and (Frink) front plow.
2 Caterpillar Diesel Road Graders, Model 12 with Roto-Wing attachment, grader blade and front plow (Balderson).
1 Oshkosh 4-Wheel Drive Truck with Root Reversible Plow and Willett Underblade.
1 International Truck K7 with Wausau Sno Plow and Sand Spreader (Century).
2 Athey Loaders, Model 12.
2 International Truck Tractors with Model 110, V-Bottom Tandem Semi Sand Spreader. Trailers.
1 Sicard Rotary Sno Plow, Model BL on Duplex Truck.
2 Marmon Herrington Sno-Gos, Model UHM.
3 Ford F500 7 cubic yard dump trucks.
2 International K 7 Dump Trucks.
1 Ford 1½ ton dump.
1 International Diesel Bulldozer TD9.
1 International Tractor Roustabout (Crane and Winch).
1 Cleveland Caterpillar Diesel Tractor.
1 International 2½ ton Tail Gate Hoist.
1 Federal C-2 Wrecker with Crane and Winch.
1 Federal 12½ ton Tandem Trailer.
1 Mobil Sweeper—International VHBD 264.
1 Dodge 2½ ton Truck Tractor.
1 Allied "Jetseal" joint sealing machine.
3 Ford pickups.
1 Chevrolet pickup.
1 Oliver Tractor front end Sweeper (Super 55).
1 Oliver Tractor front end loader (Super 55).
2 Oliver Tractors with Mower (Anderson)
2 Case Tractors—(Pull Sprayer-Mowers etc. magnet).
1 Rotary Mower (Worthington).
1 Steam Magnet on 2 Wheel Trailer.
1 Cleveland Trencher—Model 92.
1 Kelite Steam Cleaner.
2 Kohler Power Generators 110V.
1 Hardie Sprayer (300 Gallons) on a 2 wheel Trailer.
1 LeRoi Air Compressor—3 Wheel (Hammer and Drill).
2 23' units Fairway Mowers (Pennsylvania).
1 Roller 3-7-Ton, Units Coupled.

Tollway Aim:

SAFE DRIVING AT ANY HOUR

RICHARD W. KRESS
Maintenance Engineer
The Illinois State Toll Highway Commission
Hinsdale, Illinois

SNOW and ice removal on modern highways such as the toll roads and the Federal interstate highways is a function of the greatest importance. When millions of dollars are spent to build-in all of the latest safety innovations and the use of the roads is advertised to save time and driver strain, it would not be wise to approach the immediate elimination of hazardous winter driving conditions in a hit-or-miss fashion.

The modern highway must be treated so that it will be safe for motorists each of the twenty-four hours in every day. From the time a storm starts until the pavement is bare, there should be no let-up in achieving this safe condition. A life saved or the avoidance of a costly accident at 3 AM, is just as important then as during the morning or evening rush hour.

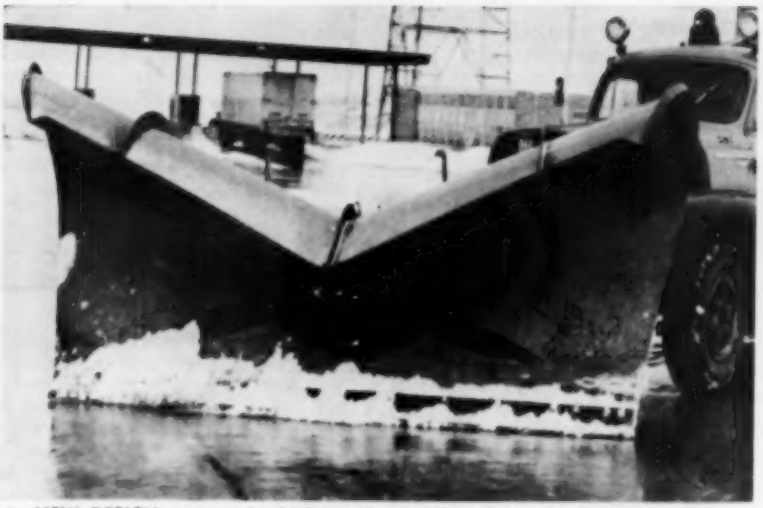
Long before the Illinois Tollway was opened for traffic, plans were formulated for the make-up of the maintenance organization with its necessary personnel and equipment. This organization was built around the needs of winter maintenance, since that is the most important operation.

The Tollway, for maintenance purposes, is divided into three divisions. One division comprises two sections and the other two divisions consist of three sections each. Each division is headed by a roadway supervisor and each section by a foreman. There are 138 men engaged in roadway maintenance, exclusive of those engaged in the maintenance of building, signs, lighting and automotive equipment.

Each of the eight maintenance sections has its own building located approximately at the midpoint of its assigned roadway mileage. This central location eliminates the need for auxiliary stock-piles

● **SKIRTING** the western perimeter of Chicago, the Tollway serves heavy commuter traffic of the metropolitan area and intercity traffic of northwestern Illinois.

● **COMPLEX** interchanges such as this junction of the Northwest and Tri-State Tollways make careful planning of spreading and plowing programs a necessity if all pavements are to be covered effectively without confusion and costly deadheading.



● **NEW DESIGN** concept for high-speed reversible plows is embodied in this unit made by Wausau Iron Works and being used experimentally by the Tollway. With cab-controlled hydraulically operated reversing mechanism, plow cleans a full 8 to 9 ft. swath, casting snow to the right or left from the six-foot high discharge ends.

● **REVERSING** feature is one of particular significance on the divided multiple-lane highway where plowing can be done toward the storage areas in the median or along the outside edges of the roadway. In this type of operation, each plowing unit should be sufficiently versatile to combat varying conditions encountered.

of chemicals, abrasives, and loading equipment to be located at a distance from the building area. In most cases the section building and storage yard are located within an interchange which facilitates maintenance truck movements in either direction without crossing the median (always a dangerous movement). During the winter months, the buildings are manned twenty-four hours a day with one or more men, depending upon weather conditions. These men can immediately spread materials on local icy spots if and when they occur, or call out additional help as needed.

The winter roadway equipment should be of sufficient size and number to spread chemicals and/or abrasives on all the mainline and ramps within an hour's time. The basic equipment units for each section are two, four-wheel drive trucks of 32000-GVW class, each equipped with a 7-cu. yd. hopper, under-body blade, right-hand discharge plow, and one equipped with a right-hand wing. The other two basic units are trucks of 28000-GVW class, equipped with power-reversible plows and 7-cu. yd. hopper bodies. These hopper bodies are interchangeable with dump bodies.

The additional number of 22000-GVW trucks placed in each section was predicated on the number of interchanges within that section. These trucks total thirty-seven for the eight sections. The lighter truck has a dump box with an hydraulically-operated, tailgate-spinner type spreader and reversible snow plow. It is a minor task to remove the spreader, install the conventional tailgate, and have this truck available to do other maintenance hauling jobs.

The attachments on each of the trucks are powered by a front-mounted, crank-shaft driven hydraulic pump. This does away with auxiliary engines to drive the spreaders. After two years of hard usage, the hydraulic pumps have given a minimum of trouble. All of the controls are mounted in the cab, permitting one-man operation. The use of power-reversible snow plows has proven indispensable both on the ramps and the mainline. Their versatility in plowing back "finger" snow drifts from either side of the pavement has been a great time saver. In many cases this type of unit will do the work of two trucks equipped with fixed directional plows.

Hard-packed snow has been plowed off the pavement with the under-body blades at speeds up to thirty miles per hour. This rapid removal rate is important in preventing the packed snow from forming ice. The underbody blade is held almost horizontal to the pavement in this operation. By using this type of equipment, we have been able to keep the cost of rented equipment at a minimum.

Each section is assigned two four-wheel drive tractor shovels with 1½-cu. yd. buckets. These units are used for loading materials and loading snow from around toll plazas and service areas. Three of the tractors have front-mounted independent-motor-driven rotary plows which are used for removing snow from bridge structures, either by blowing it off or by loading it into trucks. This equipment also serves a good purpose in "widening" ramps that become restricted due to piled-up snow.

We have been experimenting with a new design high-speed, power-reversible plow that has great throwing capacity. It looks and works somewhat like a "V" plow except that it takes a full 8 to 9-ft. swath and casts the snow to the right or left as desired. The top of the discharge end is about 6 ft. above the pavement.

The Commission engages the services of a consulting meteorologist who alerts the maintenance forces of an impending storm with information on type, intensity, and duration. This service is augmented by periodic weather forecasts sent by the U. S. Weather Bureau by teletype to the administration building and section buildings.

When a storm warning, forecasting a prolonged period of snow or freezing rain, is received during the regular work day, the foreman will divide his crew and send some men home for later duty. We attempt to limit the time of duty to a 12-hour shift. If the storm is quite severe and lasting, we will call in the sign, lighting, and building maintenance personnel who have been previously trained in snow operation procedure. The maintenance crews, during the past winter season, were called out for storm duty on 32 separate occasions. Storms varied from a freezing rain of short duration to a two-day snow fall.

At the onset of a storm, each man goes to that area of roadway that has been assigned to him. Usually the first trucks to leave the building are the 28000 GVW, large hopper-body units which go in each direction on the mainline. They will spread whatever material is indicated for that particular storm and have sufficient volume to go to one end of the section and back without re-loading. Closely following will be the smaller units to spread materials at the toll plazas, service areas and ramps.

The rate of application for the chemicals will vary from 300 to 500 lbs. per mile depending upon the temperature, humidity, type of precipitation and the amount of sun light.

During a storm period, when the traffic on the passing lanes and ramps is low, the action of chemicals is delayed. In this case we either increase the amount of chemical used or add an abrasive.

During a storm the foreman is required to go over his section of the road every two hours. If trouble spots are found he will either call out extra equipment or re-assign some of the trucks. Most of the trucks are radio-equipped which makes it possible for him to give instructions from the field. The preassignment of equipment is flexible so that it is possible to shift equipment within the section or from one section to another.

Salt is our most frequently-used and effective chemical at temperatures upward from twenty-five degrees. If the temperature is twenty-five degrees and the forecast is for lowering temperatures, a combination of salt (sodium chloride) and calcium chloride is used. This combination is of proportions varying from three to one by weight of salt to calcium chloride to greater concentrations of calcium chloride.

Due to the geographical range of the Tollway, we can expect a variance of temperature from the Wisconsin line to the Indiana line. Snow may be dry and blowing off the road at one location, and wet and sticking at another. As a consequence, each section foreman is encouraged to use the combinations of snow removal materials that best suit his needs. This elasticity has proven quite effective, and has generated good-natured rivalry between sections as to which has the better driving conditions at the least cost.

All of our snow plowing is done in tandem fashion with trucks spaced from eight hundred to one thousand feet apart. On the two-lane roadway, three trucks are used with the lead truck plowing to the left and the other two plowing to the right. The three-lane portion of the Tollway requires the use of three or four trucks depending on the depth or drifting of the snow. The use of less than two plows in tandem during a heavy snow or drifting condition has been found to be a waste of time and effort and accomplishes practically nothing.

Immediately following each storm, the equipment, including the inside of the hopper bodies, is thoroughly washed. The units are then greased and checked for any breaks or weakened parts which are immediately replaced or repaired. All minor repairs are accomplished in the section garage by a skilled mechanic. Everything of a major nature is sent to the central shop located next to the administration building. This shop, manned by a master mechanic, five skilled mechanics and three helpers, also maintains police patrol and administrative vehicles.

Preparations for Winter Must Start Early

PAT THOMSON
County Engineer
Douglas County
Wenatchee, Washington

THE MEN shoveled furiously in their race against the snow drifting over the half-buried vehicle. Inside, two figures, almost obscured by the smouldering smoke of burning upholstery in the back seat, lay gray and still against the steering wheel. The sweating men managed to pry open the side door, and dragged the two moaning figures out into the whipping wind. Bundling them into a waiting FWD snowplow, the frostbitten victims were hurried to the local hospital.

These two were lucky. Others who were caught in the —32°F, wind-blasting blizzard did not fare so well. In a battle against drifting snow, time is definitely on the side of the elements. An hour of 45-mph wind can close more roads than a road department can plow open in a week. An hour will make the difference between smoothly flowing traffic on county arterials and complete paralysis of half the system. A wind-whipped blizzard gives no time to worry about expenditures or methods of procedure. Snow removal operations must strike quickly and in the most efficient manner. With 43 inches of snow on the level, there is no time to start training personnel and organizing a procedure. If you are not already prepared, a debacle will result. People may die. Livestock may starve. Your department will not have served its primary purpose of keeping the rural lifelines open for the benefit of the public.

Douglas County, Washington, lies nestled against the foothills of the Cascade Range. Our 1658 miles of county roads traverse all topographical elevations from the 5400-ft. Badger Mountain to the 600-ft. Columbia River valley. We have faced, and know that we will encounter again, almost every type of snow problem that exists. Storms have included 43 in. of snow on the level, heavy winds piling wet snows into eighteen foot drifts and roads with 10,000 vehicles per day that silverthaw into solid sheets of glaring ice. We are certain of one thing:

● **ESSENTIAL for winter preparation is putting road surface in shape for fast and easy plowing when snowfalls come.**

● **WHEN deep snows come and drifts are frozen, both men and equipment must be in top condition to meet the challenge.**

we could not handle our snow-plowing problems if we were not prepared—if our organization was not geared for action snow-wise.

How do you prepare for the necessities of snow removal? First proper equipment is needed—equipment to suit the job. In early snowfall, we use the straight-blade, reversible type of plow for highspeed plowing —throwing the snow as far as possible. We find that in highspeed plowing, the reversible tripping feature permits passing over obstacles without jar or damage to the equipment. There is also a great deal of difference in the curvature of moldboards and we select types that will cast snow the farthest without throwback over the hood of the truck. Once a snow "berm" starts to accumulate on the shoulders, the wing-equipped rigs are called into play to move these windrows back into the ditches.

When drifting occurs, the Vee-plow-equipped motor patrols and four-wheel-drive trucks are called into action. In the straight blade plow, we prefer a reversible tripping-type that is hydraulically controlled from the cab. Operators then can push snow over one-way fills, right, left, or bulldoze ahead by a flip of the cab lever.

However, the dollars spent in obtaining proper equipment are wasted unless that equipment is ready to roll when the snow hits. With the public depending upon an increasingly mechanized organization, it is our duty to be positive that the equipment is properly maintained. This requires that the equipment be ready to go in the fall and that a good system of daily maintenance checks be carried out throughout the winter. Snowplowing is perhaps the most adverse conditions under which equipment can operate and certain failures will occur rapidly.

As one of the preparations for proper snow plowing, our shop foreman carries out a continual program of repair and replacement. The program is predicated on hours of use or miles of travel, depending upon the machine. Equipment is serviced on a definite schedule whether "outside" indications show a need or not. Preventive maintenance of motors, transmissions, and final drives reduces downtime delays.

Trained personnel, familiar with the roads and with the organization plan, are a necessity, not a luxury. To attempt to maintain our "blizzard blitz" program with an untrained group would require us to spend more time locating the lost trucks than in getting drifts moved. Trained personnel speed-up operations because of their knowledge of the equipment, the road system, weather variations, and general topography.

Another item needed for efficient operation is an organized plan of procedure. With a properly publicized plan, people know how your organization is going to react to blizzard conditions. They do not panic when the going is rough, for they are certain the plan is being carried out.

Our plan is relatively simple. We plow all school bus and mail routes, first opening them, in the case of heavy snows, to at least one-way traffic. In most cases, these routes will cover the main county arterials. Then, as widening proceeds on these roads, the heavy plows continue with the remaining arterials and the secondary feeder routes. Finally, we progress to the lesser routes. We realize that this system sometimes leaves the man in the lonely coulee drifted in for a week or more; but the bulk of the people, traffic, and livestock have been taken care of, so that the economy of the county can move ahead.

We vary this procedure only under emergency conditions. When a person calls us to report an emergency illness, we usually require that a doctor be contacted first. The doctor then verifies the emergency condition and we take him with us at the expense of the individual. This soon cures the lonely bachelor who wants to get out just to sit in the poolhall and play pinochle and it gives people faith in the program.

In the suburban area, where traffic reaches 10,000 vehicles per day, we do most of our plowing at night. Except under the worst conditions, our sanding is done before 7 A.M. so the going-to-work traffic is protected. It is necessary here to have the sand and salt placed for the quickest, most strategic operation.

Clearing and Drainage

Before the winter season begins, it is important to put the roadway in the best possible condition. Ditches must be cleaned and widened, shoulders squared, backslopes burned free of weeds and all culverts checked for proper drainage capacity. Tumbleweed (Russian thistle) is probably the greatest menace that we have to efficient snow removal. It seems to thrive in our region, growing headhigh. Tumbleweed will cause drifts to appear where there should be none. Tangled into a wing, it will render a plow almost helpless. Floating in a large mass into a structure, tumbleweed will plug the channel so tightly that a backhoe can hardly dig it out. This is a major problem in our region of chinook run-offs where we can experience flood conditions followed by heavy snows and two more months of winter. Roads severed by the gashes of washed-out culverts cannot be plowed. While we do not have the funds nor the time to accomplish all of the roadway maintenance projects that are desired

● **RADIO communications offer an essential control in directing the activities of a far-flung organization during emergency and cold-weather programs.**

and needed, we make every effort, starting with our arterial system and working down.

All of our winter operations are tied together through the use of a well-planned, generous radio communication system. We have a radio in every snowplowing rig that works, a total of forty-five sets in all, throughout the county. The area supervisors are in constant control of their units at all times. Without our radio system, we could not function effectively as a team.

Last but not least, we are courteous to the public. Blizzards bring about trying times. A shivering farmer out of fuel oil, a stockman out of feed, or a housewife with an ill child, is not always reasonable. Often, his situation leads him to say things he does not actually mean. Even though our own personnel get jumpy from the long arduous hours, they are instructed to consider the source and ride with the verbal blasts. Many sheepish apologies have been rendered when nerves, weather, and conditions were more pleasant.

In all, we have found that preventive maintenance on our equipment and roadway system, preparation of our personnel and patience in operation paves the way to successful snowplowing.

Chemical Mixtures for High Speed Winter Maintenance

LAST winter severe weather, which included record snowfalls and extremely low temperatures for long periods of time, forced maintenance engineers in the cold weather states to look for positive answers to the questions of how to melt, or prevent formation of, ice or hard packed snow on highways. Chemical mixtures of calcium chloride and rock salt had been successful in a number of applications in previous years and many maintenance engineers found the use of mixtures a welcome answer to melting ice and snow fast. Handling of the mixture as a bulk material which can be premixed and stockpiled in maintenance yards and loaded by equipment into spreading units has further enhanced its value.

The heavy traffic on expressways, toll roads, and municipal streets calls for fast action when a storm strikes. Using mixtures of calcium chloride and rock salt at the rate of one part calcium chloride for three parts rock salt by weight proved to be an efficient and economical method for keeping roads clear even in low temperatures. Modern traffic helps melt the ice once it gets a start from the application of chemicals. The rate of application or the mixture strength can be varied depending on the amount of traffic and the temperature or the degree of thickness of ice on the highway.

The problem of storing the mixture of the chemicals in maintenance yards is easily solved by placing tarpaulins over the pile of mixed chemicals, to protect it from direct rain. With this precaution, storage is feasible for extended periods. If a small crust forms over the pile, it can be broken up and still used in modern mechanical spreading equipment.

Courtesy The Tarrant Manufacturing Company

● **MODERN equipment combined with modern materials and well-trained crews assure quick and effective treatment.**

Courtesy The Calcium Chloride Institute

● **SAFE driving ahead is promised to the driver traveling this bare pavement provided by an effective program.**

MORE WATER for DETROIT

GERALD J. REMUS
General Manager
Board of Water Commissioners
Detroit, Michigan

THE SPRINGWELLS Pumping Station is one of three major water treatment and pumping stations operated by the Board of Water Commissioners of the City of Detroit. The Detroit system provides water to 3.4 million people in Detroit and 49 suburban communities. The service is provided to 42 percent of the State's population, and this percentage is ever-increasing. Contract negotiations are under way to provide water supply to at least 14 additional suburban communities.

The Springwells Pumping Station was built after many studies had been made in 1924 and after the determination that Detroit should do the areawide water supply job. The original section of the plant was completed in 1930. It is located on Warren Avenue in the City of Dearborn adjacent to the Detroit city limits. It is a complete water treatment plant, including pumping facilities, treatment capacity, water mains, generating equipment and all required auxiliaries. The plant receives its raw water supply from the mouth of the Detroit River, through an intake lagoon and structure located at the head of Belle Isle. An extensive tunnel system, consisting of a 15 ft. 6 in. diameter river tunnel in rock, shore shaft, screen chamber, and 14-ft. and 12-ft. diameter land tunnels, conveys the raw water by gravity to the Springwells Station. The distance from the mouth of the lagoon to the station is 11¾ miles. The original section of the station, located on a plant site of 43.6 acres, was designed for a continuous rated capacity of 272,000,000 gallons per day, and it was equipped with 68 filters having a total sand area of 1.7 acres.

In 1955 the Detroit water system management again reviewed the policy of "area" supply and reaffirmed its position of supplying all "area" water demands. This required continuance of a capital improvement program which has cost $100,000,000 during the last ten years and which will cost in excess of $172,000,000 in the next 20 years.

The enlargement program provided extra transmission mains, with related "peak-hour storage" facilities; a raw water, tunnel pressurization, booster pumping station near the source of water supply; additional treatment plant capacity at the Springwells Station: extra pumping capacity, both raw water low lift pumps and purified water high lift pumps; clear water reservoirs; chemical treatment equipment; and all necessary auxiliaries.

The transmission main system was expanded by constructing 72 in., 54 in., and 48 in. water mains. This construction has cost approximately $12,100,000; and at least another $8,000,000 must be expended for transmission mains and storage facilities properly to handle the additional pumping capacity that has been provided. This work is under way and will be completed in two years' time. These mains and storage facilities are being constructed in Detroit and suburban areas so that water can be delivered to each community's front door."

To supply the additional raw water that would be required for the expanded Springwells Station and to develop the capacity of the tunnel system to its maximum, a raw water, tunnel-pressurization, pumping station was constructed at Water Works Park near the raw water intake structure. It is connected to the main tunnel supplying both Northeast and Springwells Stations, and is equipped with four, 250 MGD, variable - pitch, impeller pumps which can increase the head of the raw water tunnel 52 ft. to supply the Springwells Station. This pressurization station will operate when the tunnel system cannot deliver water in sufficient quantity by gravity flow to the pumping stations. The procedure dictates that the operation of this pressurization station will occur only during peak-load periods.

Rather than build another northwest Detroit pumping station and treatment plant, it was decided to increase the size of the Springwells Pumping Station because considerable savings could be made on building construction, equipment and operating forces. A plan was developed for adding the necessary additional segments of the plant at Springwells after exhaustive hydraulic tests, analysis of operating records, plant foundation boring studies, methods of interconnecting improved plant development with older sections of the plant, costs of property, and a study of the water transmission distribution system for the metropolitan area. Considerable ingenuity was exercised on the part of the engineering and operating personnel in adding large sections to the existing plant and still keeping that plant in operation.

Larger raw water pumping equipment had to be installed in the existent low lift plant at the Springwells Station. The rated capacity of this low lift system was increased from 434 to 820 million gallons per day. To transmit the raw water from the low lift to the treatment plant required the construction of two additional raw water conduits connecting the low lift with the settling basins.

Surge weir levels, improved "shunt" water level control system, and additional parallel clear water conduits were installed. Replacement pumps and motors were installed in the high lift pumping station to handle pure water to the transmission main system, increasing the station capacity from 601 to 850 million gallons per day. A 20 million gallon reservoir was constructed to increase the "on the site" purified water storage to 60 million gallons. Carbon slurry and liquid alum tanks were constructed underground, with all of the appropriate controls to insure reliability of our treatment practices, to provide proper storage capacity of these chemicals, and to make it possible to purchase these chemicals at the optimum price, thereby improving the efficiency of the station.

To increase the size of the Springwells Station it became necessary to provide additional treatment facilities for another 200 million gallons per day. This required a treatment building, settling basins, filter plant, service building, and wash water equipment, with all related auxiliaries.

The raw water from the tunnel system that was pre-chlorinated near the "intake" is pumped from the low lift station through the treatment building, where alum and carbon are added, where a rapid mix occurs and flocculators prepare the water for the settling or coagulation basins. There are two rapid mixing chambers, and each is equipped with a vertical, turbine-type mixer, operated by a 20 h.p. electric motor and with change gears for speed control.

From the mixing chamber the water flows to the flocculators. There are 20 units, and each consists of four successive compartments, each approximately 19 x 20 feet. The flocculators are of the wooden-blade, steel-arm, reel-type, with a drive shaft which is mechanically continuous throughout the full length of the longitudinal centerline of the chamber. Each flocculator is driven by a variable-speed drive, with a range of 3 to 1, and the maximum peripheral speed of the flocculator paddle assembly is 1.8 feet per second.

The twenty flocculation chambers discharge into four settling basins, each 484 ft. long, 100 ft. wide, and with effective water depth from 13 to 17 ft. Detention time through the basins equals 2.9 hours at 200 MGD. Effluent from the basins flows through three 48-in. by 48-in. manually-operated sluice gates. The six such gates in the north two basins lead into the west settled water conduit, and the six south gates into the east settled water conduit. From the settled water header the water flows to the Filter Building. Valves are installed in the influent and effluent conduits to control flows, and these conduits are interconnected so that the existing and new coagulation basins can, in part, work in parallel and that either settling basin can provide water for the new or for the old section of the filter plant.

The filter building addition provided 40 filters, raising the plant size to 108 total, and covering 2.7 acres of filter area. This developed a filter plant capacity of a continuous rating of 432 million gallons per day under all conditions, and with a maximum rate of 540 million gallons per day. The filter building contains 10 double filters on either side of a central longitudinal gallery. Thus there are 40 filter beds served by 20 gullets and 20 direct-acting rate controllers. All filter valves, with the exception of filter-to-waste valves, are rubber-seated butterfly valves with hydraulic cylinder operators. The filter-to-waste valves are manually operated double-disc gate valves. Filtering to waste is done through temporary hose connections to the wash water drains.

In 19 of the 20 double filters the sand is supported by four layers of gravel, each four inches thick and the bottom layer is supported on Leopold vitrified block underdrains. The twentieth filter contains five layers of gravel, each four inches thick and the bottom layer is supported by Criscrete precast concrete slab underdrains. Each filter bed contains 20 in. of sand, effective size 0.52 to 0.58 millimeters and uniformity coefficient of 1.30 to 1.50. The maximum rate of a double filter unit is 12.5 MGD.

Each filter bed is equipped with Palmer surface wash equipment which allows for more efficient filter back-washing at lower wash-water velocities.

Three filter wash-water pumps are located in the east end of the service building at the south end of the filter building. The wash-water system is designed to wash filters in both the old and new plants. There are no elevated wash-water tanks in the wash-water system, and a slight positive head is maintained on the wash-water headers through a make-up well which is supplied from a high pressure line through a float valve.

Disposal of waste wash-water can be accomplished by any of the following methods: 1) Gravity flow to the city sewer; 2) pumping to the sewer; and 3) pumping back to either or both rapid mix inlets for re-use of the water.

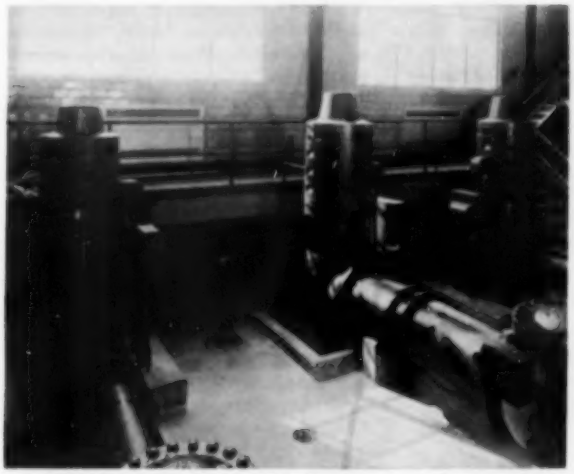
On the north wall of the service building and adjacent to the filter operating gallery is a main operating panel from which the filter rate controllers can be set by a master control system or they can be set manually. Also, on the panel are various flow and level gauges and recorders.

Post chlorine is added to the filtered water in the new plant at the south end of each of two filter effluent conduits. After post chlorination, the filtered water flows either directly to the high lift pump suction or to the filtered water storage. There is a cross-connection between the new and the old filter effluent conduits through two 48-in. lines.

All power is provided by the 4,600-volt generating station of the pumping station or from 24,000-volt Public Lighting Commission feeders, all interconnected on a 4,600-volt network so that every unit of

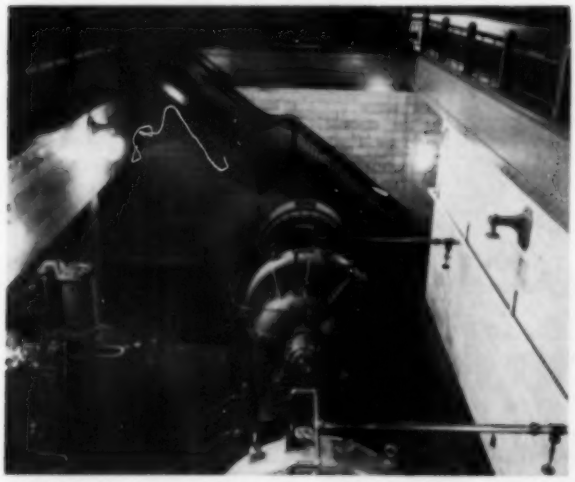
● **TWENTY** flocculating chambers are provided which discharge into four large settling basins through perforations in the exit walls in order to reduce currents and eddies.

● **FILTER** building under construction showing double filters and arch formwork for barrel roof. Double filters have maximum capacity of 12.5 mgd. 40 new filters are being added.

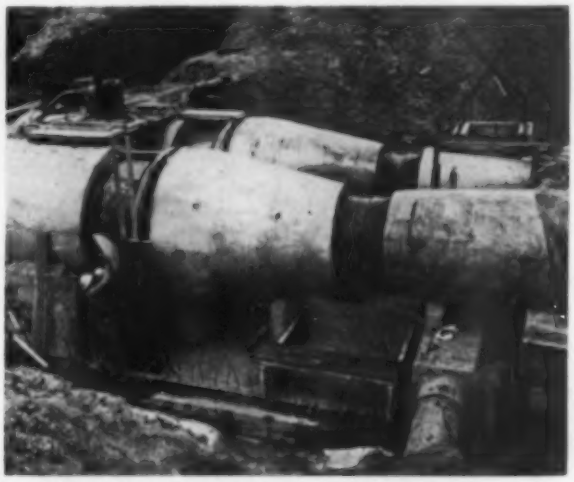


● **WOUND** rotor motor, 400 horsepower, 4,600-volt, 720 RPM, a part of the new pumping equipment which will increase plant capacity to more than 800 mgd to meet needs for future.

● **RAW WATER** outlet structure at low lift pumping plant under construction. Two additional raw water conduits were added and rated capacity was increased from 434 to 820 mgd.



● **TYPICAL** pump installation in the high lift pumping system. Replacement pumps and motors increased capacity to 850 mgd.



● **RAW WATER** Venturi meters were installed in connection with the increased facilities for supplying raw water needs.

operating equipment has more than one source of power supply.

General construction contractors included F. H. Martin Construction Co. and O. W. Burke Co. Equipment included DeLaval pumps with motors by Ideal Electric and Worthington pumps with motors by Elliot. Lock-Joint furnished pipe.

Control of all phases of the treatment processes is located in the laboratory. Here chemists are continuously checking the water and making the necessary adjustments for the most complete and efficient control of treatment throughout each plant. A sampling sink at the west end of the laboratory continuously produces samples from twelve strategically located points in the treatment process. Above the sample sink is a master panel with gauges indicating flows and levels at different locations in each plant. To the south of this panel is located another panel from which the chemist can operate valves controlling the flow of raw water in each of the four raw water conduits. An annunciator panel gives an indication of any malfunction of chemical feeding equipment for abnormal levels in chemical tanks.

General Comments

The Springwells addition included many design and construction features which contributed greatly to the solution of many difficult construction problems. It also includes facilities for the application of modern techniques in water treatment which will permit economies in overall plant operation with increased plant production.

Mention might be made of such features as: precast-concrete, wash-water troughs, surface wash, filters arranged in pairs, drive-in ramp for pipe gallery, thin-shell, barrel roof, "shrinkage strips" in large concrete slabs, shafts of flocculators parallel to flow, perforated baffle wall exit from flocculators to settling tanks, precast-concrete raw water conduits, under-drainage system at different elevations, sectionalized excavation for deep foundations, steel sheeting to maintain stability of foundations, and similar factors.

Of utmost importance is the public's support in getting an operation of this type financed and constructed. Special features of this relate to the building of a plant by the City of Detroit in a residential area in the City of Dearborn, with construction of large water mains and storage facilities in cities other than Detroit.

A complete feature article could be written on the ramifications of signing contracts to provide water for communities in three counties and to get a water program uniformly accepted in these areas—particularly when one considers the administrative problems of dealing with in excess of 118 agencies—federal, state, county, township, city, and various bureaus related to water system operations.

Another feature of merit is the time schedule, wherein from the day that the first line was placed on a drawing until the time the plant went into service a period of approximately 3½ years elapsed.

It would be amiss if it were not pointed out that tax moneys were not used for this purpose. It was all done by revenue bond financing, supported entirely by the revenue of the system; and the bonds that were sold were given Class AA investment identification.

Original and Present Facilities at Springwells Water Plant

Item	Original Plant	Additions	Present Plant
Area of Site, acres	40	12.736	52.736
Station Capacity, mgd	340	200 (d)	540
Low Lift Pumping Station			
Number of Pumps	10		10
Total Rated Capacity, mgd	434.4	385.0	819.4
High Lift Pumping Station			
Number of Pumps	16		16
Total Rated Capacity, mgd	601	249	850
Raw Water Conduits	2	2	4
Raw Water Venturi Meters	2	2	4
Rapid Mix Chambers	——	2	2
Mixing Time, sec.	——	42	42
Flocculating Chambers	——	20	20
Flocculating Time, min.	——	33	33
Coagulation Chamber	1		1
Retention Time, min.	13.5		13.5
Sedimentation Basins	4	4	8
Retention Time, hours	1.8	2.9	1.8 and 2.9
Surface Loading, gals. per sq. ft. per day	1860	1040	1860 and 1040
Filters	68	40	108
Filter Sand Area, acres	1.7	1.0	2.7
Design Capacity, mgd	272	180	452
Maximum Capacity, mgd	340	200 (d)	540
Wash Water System (a)			
Tank Capacity, gal.	2 @ 50,000	——	——
Number of Pumps	4	3	3
Pump Capacity, gpm	28,000 total	8,000 to 26,000 ea.	8,000 to 26,000 ea.
Waste Wash Water System (b)			
Number of Pumps	3	3	3
Capacity, gpm	3 @ 6,000 18,000	2 @ 12,000 1 @ 6,000 30,000	2 @ 12,000 1 @ 6,000 30,000
Weir Chamber (c)	1	1	1
Shunt System	Yes	Yes	Yes
Reservoirs			
Number	2	1	3
Nominal Capacity, mg	40	20	60
Power Plant			
Boilers, hp	2—1,000		2—1,000
Turbines, kw	2—5,000 3— 500		2—5,000 3— 500
PLC Power Feeders	2	1	3
Capacity, kva	12,250	6,250	18,500

a) Original wash water system retained for emergencies.
b) Original drainage pump station retained to overcome effect of surcharge in Wyoming Avenue sewer and for special phases of plant operation.
c) Function of original weir chamber changed.
d) Designed for maximum capacity exceeding 250 MGD.

• • •

Urban Rehabilitation

A measure proposed by the Urban Rehabilitation Commission of Columbia, S. C., requires at least two exits on every story above or below the first floor; a complete bathroom for each 8 persons or three rooming units; adequate water heaters and hall lighting; and other standards of safety and sanitation.

AIR POLLUTION and THE COURTS

JAMES A. TOBEY, Dr.P.H., LL.D.

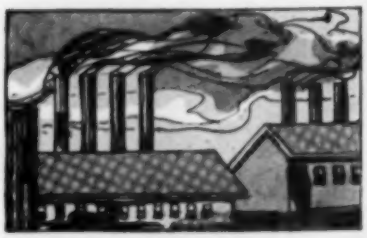
Member of the New York Bar

CONTROL of air pollution in the United States is generally recognized as one of the most urgent of our modern public health problems. Our atmosphere constantly is being contaminated by fumes from thousands of industrial plants, by the hydrocarbons from the exhausts of more than 67,000,000 motor vehicles, by smoke from incinerators and dumps, by windblown dust, by forest fires and fires in the backyards of individual householders, by radiation, and by numerous other adverse conditions which are the unfortunate and inevitable result of an expanding industrial and urban civilization.

All of these detrimental and annoying conditions are more or less controllable by legal and technical means, but only rarely do they seem to be adequately controlled. Since the adoption of the Air Pollution Control District Act in California in 1947 and the general air pollution act in Oregon in 1951, only about a dozen states have enacted laws dealing explicitly with this problem. (1) Any action in the other states depends upon the right under the police power of the state to regulate and abate public nuisances. (2)

The gravity of the situation was emphasized by President Eisenhower in a special message to Congress in January, 1955, when he said: "As a result of industrial growth and urban development, the atmosphere over some population centers may be approaching the limit of its ability to absorb air pollutants with safety to health."

In that year, 1955, the 84th Congress enacted a law (Public Law No. 159, 69 Stat. 322, 42 U.S.C. 1857) directing the Public Health Service of the Department of Health, Education, and Welfare to conduct and support research on air pollution, and to provide technical services to State and local governments and to private agencies. In 1956, Congress appropriated $1.75 millions to carry out this law, $2.75 millions in 1957, and $4 millions for each of the fiscal years 1958 and 1959. Of these funds about 80 percent have been devoted to



research. Early in 1960 a bill sponsored by the Administration was introduced in Congress to make this national air pollution act a permanent one, to eliminate a ceiling of $5 millions on appropriations, and to give to the Public Health Service stronger powers, such as the right to hold hearings on air pollution of an interstate nature or of broad public interest. Air pollution, like communicable disease, never recognizes political limits.

The significance and the complexity of the air pollution problem were cogently brought out at a national conference on the subject called by the Public Health Service in Washington, D.C., in November, 1958. The proceedings of this three-day conference, attended by about 900 experts, are printed in a volume of 526 pages (3), which contains many valuable suggestions on the technical features of the problem.

The ultimate effects of the contamination of the air are of concern to the medical profession, to agriculturists, and to sociologists, but the technical control of this hazard fundamentally is an engineering matter, one requiring the joint efforts and skills of sanitary, chemical, and mechanical engineers. The research and training programs of the Public Health Service are undertaken at the Robert A. Taft Engineering Center at Cincinnati, Ohio, where several thousand officials have been trained.

From the administrative standpoint the control of air pollution depends upon effective State and local legislation, competently and reasonably enforced by trained officials. Municipal ordinances for the control of smoke have been in effect in this country since 1881, when the cities of Chicago and Cincinnati are said to have adopted the first legislation of this nature. Today it is estimated that about 10,000 communities in the United States have air pollution problems, but that only about one-quarter of them possess adequate legislation to cope with the situation.

Courts of last resort in the United States have been ruling on various forms of air pollution for approximately a century. As early as 1864, excessive smoke was declared to be a nuisance in a court action in St. Louis, and since that time there have been literally hundreds of decisions on the subject. (4)

Whenever reasonable regulation of air pollution by the State and its political subdivisions, such as municipalities, counties, and boards of health, has come before the courts, almost invariably such regulation has been upheld as a valid exercise of the police power of the State in the interests of the public health and general welfare. A review of leading cases on the subject was presented by the author in the October, 1957, issue of PUBLIC WORKS Magazine (5), but since that time the Supreme Court of the United States and a number of state courts have handed down important decisions, with which all interested persons should be familiar.

The Supreme Court and Air Pollution

Nearly half a century ago, in 1916, a smoke control ordinance of the City of Des Moines, Iowa, was upheld by the Supreme Court of the United States as a constitutional and valid exercise of the police power, a power expressly reserved to the States by the 10th Amendment to the Federal Constitution. In 1960, the highest court in the land again sustained as valid a city smoke abatement code, that of Detroit, Michigan. Because of certain circumstances the later decision was even more far-reaching and drastic than the earlier one.

In the Des Moines case of 1916 a

(*Continued on page* 162)

● **INFLUENT** structure, showing mechanically cleaned bar screen followed by grit chambers and, at far end, Parshall flume.

NAVY HOUSING PROJECT *Prompts* SEWAGE TREATMENT PLANT CONSTRUCTION

L. E. WEBER
City Manager,
Beeville, Texas

CONSTRUCTION of 208 single family residential Capehart Housing units for Beeville's Naval Air Training Station, Chase Field, providing the push to get adequate sewage treatment facilities in this City of 16,000 population. When the Navy disclosed its plans for building Capehart Housing, the City immediately authorized a study of existing sewage treatment facilities and their needed enlargement through Lockwood, Andrews and Newnam, Consulting Engineers of Houston and Victoria, Texas.

The population of the City of Beeville increased about 38 percent from 1940 to 1950. This rapid growth placed extreme demands on the existing municipal facilities, and a sewage treatment plant was constructed in the early 50's to fulfill the needs of the community. This plant was designed to provide what was thought to be adequate treatment through the year 1976. However, due to the impetus of Chase Naval Air Station, Beeville continued to grow at an even more pronounced rate, and the "new plant" became obsolescent within four or five years; thus, it again became necessary to provide additional treatment facilities.

The "new plant" of 1951 consisted of a primary clarifier, high rate or roughing filter, a standard-rate or polishing filter and a final clarifier. Effluent was discharged into Poesta Creek, a dry stream located in the City and very near Chase Naval Air Station, only three miles from Beeville. Studies in 1956 by Lockwood, Andrews and Newnam disclosed that the 1951 plant, which had an operational capacity of 0.65 mgd, was in good condition. However, the sewage flow of 1.0 mgd exceeded the plant capacity by some 0.35 mgd. Excessive flow was directly bypassed into Poesta Creek as raw, untreated sewage. The sewage effluent and bypassed sewage comprised almost the entire flow of Poesta Creek, and since no dilution was afforded, the creek became a public hazard to both the City and the Naval Air Station.

The overloaded condition of the original plant could have been eliminated by either expanding the 1951 plant, or by constructing a new and separate facility. It was found that expansion of the existing plant would not only be difficult and expensive, but that once expanded, further expansion for needs beyond 1971 would be impossible because of space limitations. Also, sewage flow from some of the probable outlying development in low areas would require lift stations. These factors, plus the desirability of more flexibility in operations by the use of two plants, led to the recommendation to construct a separate plant.

Financing New Facilities

Due to the intense Navy interest on adequate sewage treatment, the City was able to obtain a construction grant in the amount of $28,000 from the Navy in addition to the $84,300 Health, Education and Welfare Department grant. The Navy grant was based on a formula designed to pay the construction cost of that portion of the additional plant required by the addition of

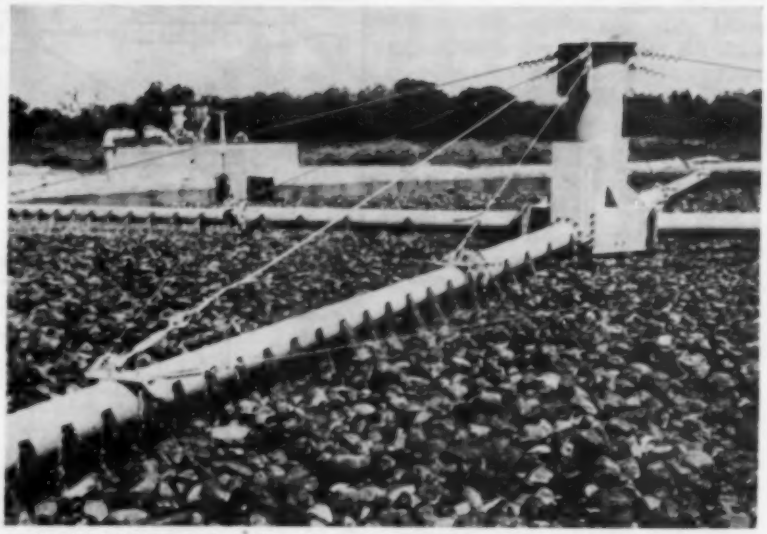
the 208 Capehart houses, but excluding the cost already contributed by the Department of Health, Education and Welfare so as not to create overlapping Federal grants. The largest portion was intended to be paid from previously authorized revenue bond funds. Even with the varieties of revenue available, the total quantity was not enough at the time of taking bids because of increases in cost while making preliminary plans. It was necessary to revise the plans slightly and readvertise. Separate bids were let on the interceptor line and the plant. It was then necessary for the City to delay the award of the interceptor line while it: 1) Authorized and issued warrants for the interceptor line construction; 2) reworked the Public Health Service grant agreement to cover the plant only instead of the plant and the line and 3) renegotiated the Navy construction grant also to include only the plant.

The two Federal construction grants, totaling $116,400 were renegotiated during the period the bids were held for award with a total loss of only $2,000 in construction aid even though the $42,900 influent line was then financed separately by warrants during this same period.

Plant Description

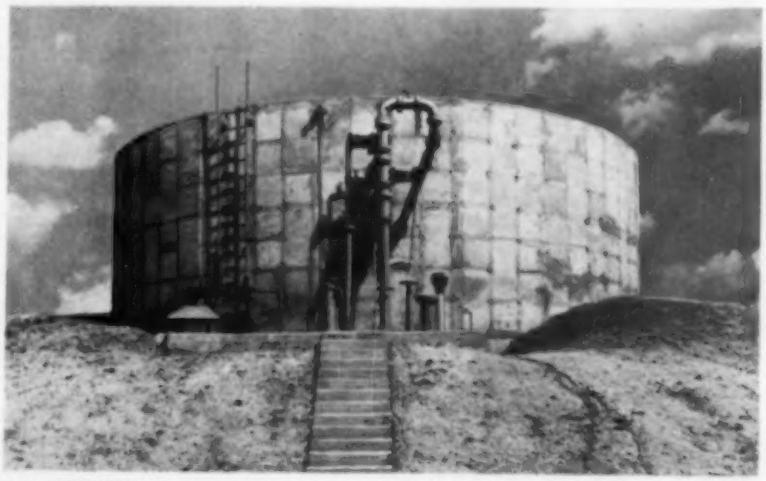
Several types of plants had been considered, and all but three were eliminated as being unsuited to Beeville's particular needs. Choosing the type of plant included the usual practice of considering the cost, degree of treatment desired and future expansion. In addition, specific requirements of the Texas State Department of Health, Public Health Service, U. S. Navy and local interests were considered. Preliminary plans from the three possibilities were developed to an extent that accurate cost estimates could be prepared for comparison. Except for the filters, the three types of plants were similar. Consideration was given to a standard-rate filter arrangement, a standard rate filter preceded by a high rate filter and two high rate filters. The plant using two high rate filters was selected because of the lower initial cost of the plant.

It was decided to develop a facility which, which, jointly with the existing plant, would provide treatment through 1971, with a BOD reduction of 90 to 95 percent. Provisions were to be made for future expansion. An estimated flow of 1.68 mgd was anticipated for 1971. With minor modifications, the existing 1951 plant could be expanded to



● **FIRST-STAGE trickling filter is 70 ft. in diameter and 5½ ft. deep; secondary filter has same dimensions. Design flow is 1.68 mgd, with maximum of 3.9 mgd.**

● **SIX PUMPS are provided with total capacity of 6,600 gpm. Space is available for two additional pumps when needed. This view shows three of six electric motors.**

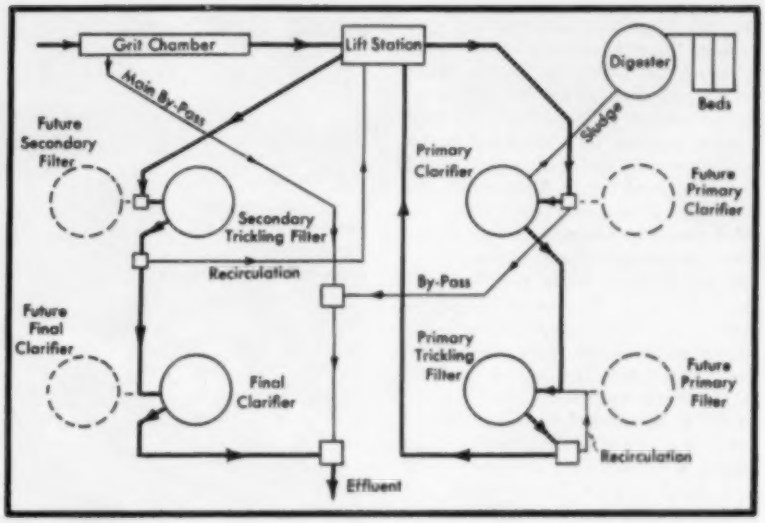


● **DIGESTER before completion. This is 40 ft. in diameter and 30½ ft. deep, with a capacity of 40,400 cu. ft., or 3.6 cu. ft. per capita. It is of floating cover type.**

treat 0.80 mgd; therefore, the proposed plant was designed for 0.88 mgd. All pipe sizes, grit chambers, pumps and division boxes were designed for double capacity, or 1.76 mgd. Layout of units was such that additional and identical clarifiers and filters could be constructed, if desired, in the future.

Collection of sewage in Beeville is divided by the aforementioned Poesta Creek, and the growth of the City has been such that about one-half of the collection system is on one side of the creek and one-half on the other. Main sewer lines run on each side of the creek toward the 1951 plant. Just opposite the plant a sewer across the creek connects the two lines into a common line to the 1951 plant. To simplify the collection system, the new plant was located on the opposite side of the creek from the 1951 plant. An interceptor line was constructed from the last manhole of the existing line to the new plant. With only minor revisions to the existing manhole, an extremely flexible flow division system was available without further expenditures. An increase in head of about 1½ feet because of a failure in the 1951 plant will cause a reverse flow in the existing creek crossing to the line to the new plant. Similarly, failure in the new plant will automatically divert sewage to the 1951 plant.

Effluent normally flows by gravity into the dry creek bed, but provisions had to be made for discharge at flood water elevations of the creek. Many creeks in this area of Texas flow intermittently; yet immediately following rains, flooding is quite frequent. To prevent floodwaters backing up into the plant, during flood conditions the sewage receives primary treatment only and is then pumped into a head box with an elevation above the flood flows, and is discharged into the creek by gravity.



● **SCHEMATIC diagram of the new plant shows provision for possible expansion.**

Since the two plants are only one mile apart, it was decided to have only one operator for both plants. The 1951 plant was "semi-automatic" and required some operating attention, but it was decided that the new plant should be as automatic as possible. Division boxes with weirs were constructed at each unit with bypass lines for overflow conditions. A malfunctioning piece of equipment will increase the head to the weir height, and automatic overflow into the bypass line. Pumps are sized and programmed to operate in sequence automatically from minimum to maximum flows, and are controlled by a Bubbltrol unit which is completely automatic.

All piping was designed to carry twice the 1971 design flow, so that when future units are added, no expensive pipe modifications will be required. On the large pipes (21 to 24-in.) the use of gate valves was prohibitive because of the cost. Large savings in construction costs were realized by the use of slide gates installed on the inside of concrete junction boxes. The use of valves is limited to suction and discharge lines on pumps in the lift station and to the digester piping room.

Construction of the new system was separated into two contracts. McKinney Brothers of Victoria, Texas, constructed the interceptor line for a total cost of $42,900, and Slovak Brothers of Corpus Christi constructed the plant for $278,000.

Summary of Design Bases and Equipment Used

BAR SCREEN
Type: Automatic mechanical
Manufacturer: American Well Works

GRIT CHAMBER
Type: Mechanical grit collector (designed but omitted in initial construction)
Design Velocity: 0.5 fps (two provided)

PRIMARY CLARIFIER
Type: Center column supported mechanism
Manufacturer: Ralph B. Carter Co.
Detention Period: 2 hrs.
Surface Loading: 790 gpd/sq. ft.
Overflow Rate: 6900 gpd/lin.ft.

TRICKLING FILTER DISTRIBUTORS
Manufacturer: Infilco Inc.
Hydraulic Capacity: 20 mgad
BOD Loading: 2000 lbs./A.ft./day
Recirculation Ratio: 1:1

FINAL CLARIFIER
Type: Center column supported mechanism
Manufacturer: Ralph B. Carter Co.
Detention Period: 2.5 hours
Surface Loading: 770 gpd/sq.ft.
Overflow Rate: 6900 gpd/lin.ft.

SLUDGE DIGESTER
Type: Single stage floating cover, unheated
Manufacturer: Infilco Inc.
Capacity: 40,400 cu. ft. (3.6 cu. ft. per capita)

SLUDGE DEWATERING
Type: Uncovered sand beds

PUMPS
Type: Vertical shaft centrifugal
Size: First stage—400, 800 and 1200 gpm
Second stage—700, 1200 and 1900 gpm
Recirculation for second filter provided by second stage pumps
Manufacturers: Chicago Pump Co. and Fairbanks, Morse

STREET CONTROL DURING BUILDING PROGRAMS

ROBERT DYMENT

HOW DO THE Engineers throughout the country's large metropolitan cities control building projects so as to minimize interference with normal or routine traffic control? How do cities plan so that construction and building can proceed, but at the same time projects can be controlled so they do not interfere with the traffic flow?

Each city has its own street engineering program in regard to this problem; some are detailed, while others depend on the immediate circumstances. Miami, Dallas, Boston, Houston, Portland, Milwaukee, Denver, Oklahoma, Grand Rapids, District of Columbia, San Francisco and Nashville have developed unique programs for traffic control during building projects, whether road, sewer or building construction. All have proved satisfactory for both the city engineering departments and contractors involved.

W. T. Eefting, Director, Department of Engineering for the City of Miami, Florida, said:

"We exercise control of building projects by: (1) Specific requirements as a part of our specifications—examples of which would be the length of time the trench may remain open, crossing of streets, closing of streets, etc.; (2) police supervision during construction; this is basically handled at the contractor's expense through off-duty uniformed policemen; (3) special controls that may be imposed by our Traffic Engineer; this would include designation of haul routes for equipment and materials, traffic detours and any type of special signing that the Traffic Engineer deems necessary in the public interest.

"Our particular Miami area has a problem as a result of seasonal variations of traffic flow. This problem is not as pronounced as it used to be. Our summer tourist business is growing to equal our winter tourist trade. Our three critical months still remain January, February and March. During this period we try to avoid conflicts by scheduling of work. When it is impossible to schedule the work out of this period, then we tightly control the contractor during the morning and afternoon peak volumes of traffic."

H. H. Stirman, Director of Public Works, Dallas, Texas, said that major streets are never closed completely as they must be at least one-half open and in some cases, three-quarters open. Work on these streets is restricted to between 9:00 a.m. and 4:00 p.m. and work may be allowed only during weekends if traffic and size of job require it. On projects with unusual traffic situations the contractor must hire an off-duty police officer to facilitate the moving of traffic.

In Dallas, minor streets, if necessary, may be completely blocked after approval by the interested parties and the establishment of a detour route. In cases where complete or partial blocking of a street is necessary, the request for approval of this action is made to the City Traffic Engineer who investigates the location and notifies the Police, Fire and Public Works Departments, and the bus company (if involved) of the action.

Thomas J. Griffin, Commissioner, Boston, Mass., Traffic Department, stated:

"This department does not have any specific program in regard to the control of building projects to prevent interference with traffic. Each building project is treated individually. Whenever a large building program is planned, conferences are arranged prior to and during construction, between the Traffic Department, the Police Department, the construction engineers, the Metropolitan Transit Authority and the various utilities with a view to coordinating the activities of the several agencies and to determine what special traffic regulations would be required. These traffic regulations might include parking prohibitions, the making of one-way streets, reversing existing one-way streets, or even closing streets. If

● **CONSTRUCTION barricade used in Nashville, Tenn. This permits use of sidewalk by contractor but provides safe passageway for pedestrians. Note PR message on sign.**

● **"SHOOFLY" in Portland, Ore., typical of temporary structures designed to carry traffic during underpass or similar construction. Traffic here is 50,000 cars/day.**

necessary, suitable detours are arranged. In cases of roadway occupancy in connection with building construction or for the installation of utilities, permits must be obtained from the Department of Public Works of the city with the approval of the Boston Traffic Department specifying the areas, time and method of operation and setting forth whatever restrictions are necessary.

"The area affected by any building project is kept under constant observation by inspectors of the Boston Traffic Department in order to insure the safe and expeditious movement of traffic at all times."

Cooper McEachern, Director, Department of Traffic and Transportation, Houston, Texas, explained that Houston has a standard permitting no more than 15 ft. of roadway space to be used in connection with the installation of a construction barricade; five feet of this space is for a pedestrian walkway when the sidewalk is blocked. The remaining 10 feet is for use by the contractor for delivery of construction materials, storage of materials, erection of construction tower, etc.

In connection with the installation of the construction barricade, the Houston Traffic Department eliminates parking on the opposite side of the street and the laning within the block is off-set or re-arranged in accordance with the remaining space available. If there is no disruption to normal pedestrian passage on the sidewalk, the barricade area in the street is limited to 10 ft. Most of the streets in the central business district in Houston are at least 52 ft. wide and there is an almost complete one-way system grid. By permitting a maximum of 15 ft. of roadway space, Houston can still maintain three or sometimes four traffic lanes with a minimum of inconvenience to the traffic flow.

It is further required that the construction barricades will be permitted in the street only so long as the contractor needs the space behind the barricade for the abovementioned reasons. As soon as the stage of construction has passed and this area is no longer needed, a contractor is required to pull the sidewalk barricade back in against the curb line whereby he uses only the width of the sidewalk barricade or approximately five feet of roadway space.

The City of Portland, Oregon, follows a specific program for traffic control during construction periods. L. H. Rosenthal, City Engineer, said:

"When a new building is under construction, the contractor may rent a maximum of adjacent space comprising the sidewalk area plus the 8-foot parking lane. He pays 1¢ per week per square foot of space used. This space must include a covered pedestrian walkway at least 4 feet wide. Fencing, walkway railing and cover are all specified in the Building Code. Building construction involves no hindrance to automotive traffic since the only land affected is that otherwise reserved for parked cars."

W. J. Weller, Traffic Engineer for Portland, elaborated on the program, saying:

"The City of Portland controls construction of buildings or facilities, demolition work, street excavation or street or highway construction which will alter the normal flow of pedestrian or vehicular traffic, by City ordinance. A person or company undertaking work covered by a building or construction permit may, on proof of necessity, obtain a permit for use of a portion of the street, alley or roadway.

"The street may be used as a work area or for the storage of materials or equipment only when the provisions of the ordinance have been complied with. As a matter of practice, the Bureau of Buildings will issue such permits for street use as are applicable to one or two-family residential zones. Requests for use of the street in any area which involves the flow of large volumes of traffic are referred to the Bureau of Traffic Engineering where they are acted upon at the discretion of the Traffic Engineer.

"In order to meet the requirements of a street use permit during construction or demolition, the permit holders in Portland must provide protective fences, barricades, ramps, sidewalks and canopies as required to assure adequate protection for pedestrian and vehicular traffic. The ordinance sets out minimum specifications for the height, width, design and strength of such temporary protective structures as required by the Bureau of Buildings. Specifications for temporary roadways or vehicular facilities are specified by the Bureau of Traffic Engineering.

"The fee for use of the street or roadway in Portland under such permit is $2 per week in residential zones. In zones of higher classification, the fee is one cent per square foot per week with a minimum charge of $2 per week. Moneys received go into the general fund. The permits are issued on a charge basis of not less than one week. Permits are not to be issued for a longer period than is necessary and not in any case for a period of greater than 90 days. Extension of the permit beyond the 90-day period is subject to the judgment of the issuing authority.

"Use of the street for storage of materials or equipment is in all cases limited to a distance of 8 ft., or the width of a normal parking lane, from the curb. Under normal circumstances, the street may not be used for such purposes in an area where parking is prohibited. In

zones where parking is restricted during peak hour traffic load, use of the street is restricted to such times as normally available for parking.

"Mobile cranes are not permitted to operate in the downtown Portland core area during business hours. They may be used only during a time beginning one hour after the closure of major department stores, until 7 a.m. and on Sundays.

"Major construction is normally prohibited in areas of high traffic volume by the Commissioner of Public Works upon advice of the Portland Traffic Engineer during the Rose Festival celebration and during the holiday shopping season between November 15th and January 1st.

"Inasmuch as the Traffic Engineer is charged with the responsibility of regulating a safe and expeditious flow of traffic in the City of Portland, projects which seriously handicap or disrupt traffic must be timed and conducted in accordance with approved recommendations. In the normal process, contractual agencies, utilities and government agencies will work out a schedule of activity to meet the approval of this bureau.

"Street closures are strictly prohibited in Portland except in cases of absolute necessity such as utility, highway or bridge construction. Where a closure is required, detouring via another street is avoided whenever possible. As a matter of policy, the Bureau of Traffic Engineering will require construction of a wooden shoo-fly trestle which will permit traffic to by-pass the closed street as nearly as practicable to the normal route."

Milwaukee, like many other cities of comparable size, has no hard and fast system for the control of traffic during the course of construction projects. Each program is studied carefully in advance to determine the feasibility of performing the necessary work "under traffic." Wherever possible, that is the system used generally here.

In Milwaukee construction of streets having a center plot, particularly, follows this plan, since traffic can normally be accommodated over one-half of the roadway while crews are at work on the other lanes. This, of course, means that the newly-completed portions will be opened and in use considerably ahead of the formal opening." In non-congested areas, it has sometimes been the practice to provide temporary lanes, parallel and adjacent to the construction work, so that traffic can flow at a reduced rate of speed.

How Detours are Selected

Where areas of congestion prevent either construction under traffic or temporary by-passes, traffic in Milwaukee is detoured over adjacent streets selected for two reasons: First to effect the least displacement of traffic flow from the general area through which it normally passes; and, second, to avoid undue congestion on already heavily-traveled thoroughfares. It stands to reason that the optimum result is not always achieved.

Bus transportation presents still another problem, according to Milwaukee Public Works officials. Rerouting, because it results in a direct inconvenience to normal users of the service, is held to an absolute minimum. Where possible, parallel and adjacent streets are employed for use of buses to reduce this disruption insofar as is possible. When detour routes are not available within the immediate area, it has been the practice to permit mass transportation to use the street which is under construction. When this has been the case, the Transport Company has furnished "gate" guards to prevent the entrance of private vehicles into the construction area.

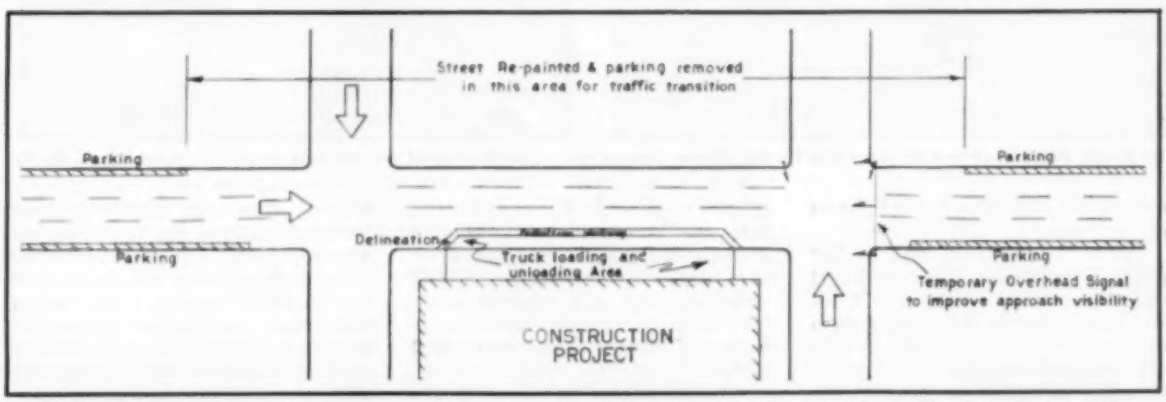
Close liaison is maintained among Milwaukee's own Bureaus to insure that all "underground" work—water, sewers, electric cable for traffic controls—proceeds in harmony with other construction work. The same procedure applies to the privately-owned utilities in the city for gas and electric work.

Except for heavily-traveled bridges and viaducts where construction work would hamper the flow of traffic on a main artery, Milwaukee does not go into night-time operations. A recent viaduct rebuilding job required a complete change of the counterweights for the structure. It became necessary to close the viaduct to all traffic for brief intervals. This was accomplished only during the very early morning hours, on a week-end, when traffic was at its lowest ebb, and then only after due notice had been given—via press and radio, as well as personal call—to all who might normally use the structure either in the normal course of travel or for emergencies.

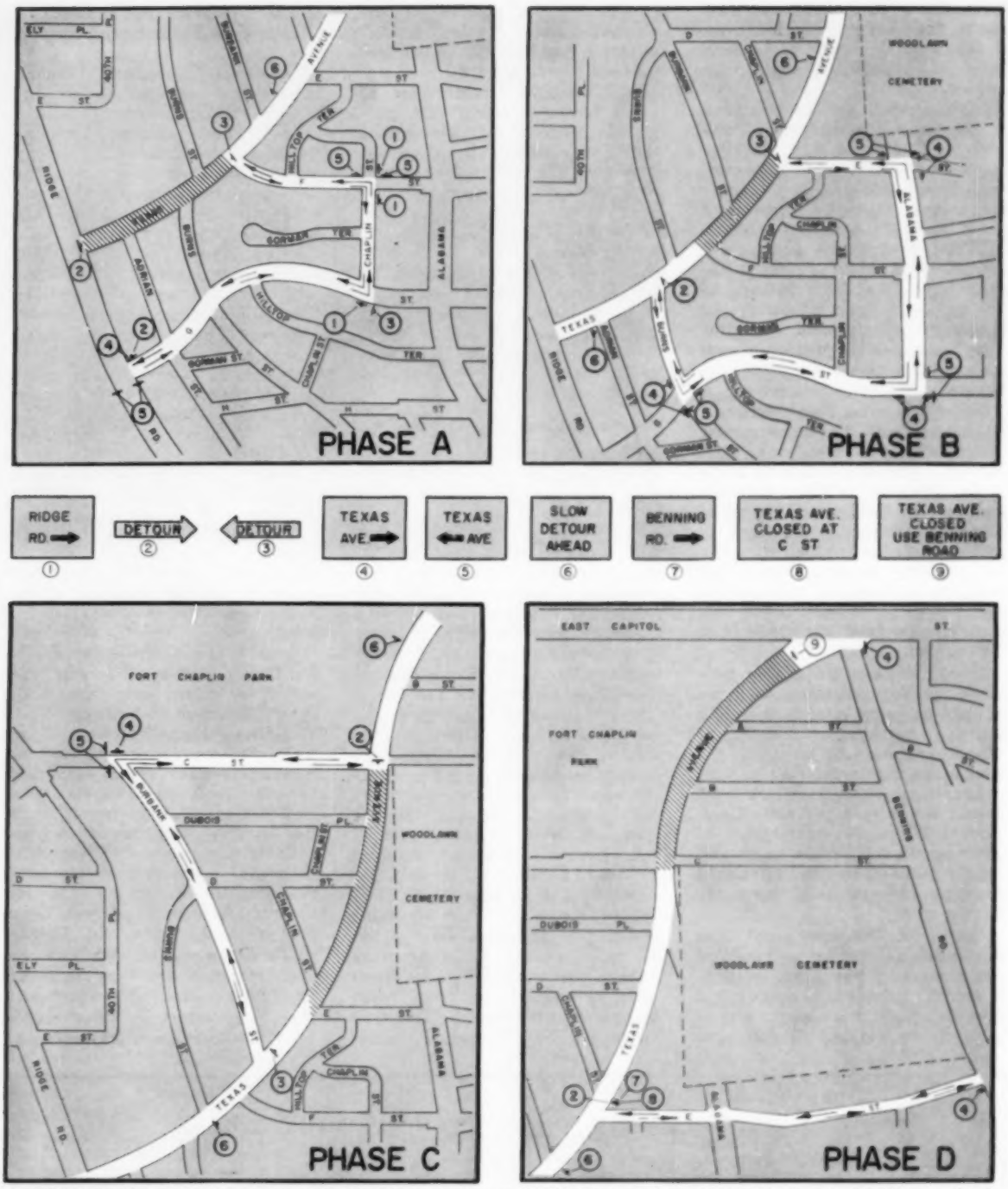
John S. Burg, Assistant Traffic Engineer, Denver, Colorado, reported as follows concerning their control program for building:

"Policies regarding control of traffic during building projects have been in effect for several years, and the procedures are as follows:

"The general contractors apply to the Building Department for the building permit—the building plans are routed to various other interested departments within the city for their checking and approval. Upon receipt of the plans, the Denver Traffic Department meets with the contractor and discusses the traffic implications involved, with barricade construction in the street or alley, construction truck space re-



● **PLAN 15 prepared showing condition ... area of planned construction to safeguard and facilitate traffic.**



● **FOUR PHASES of the detour plans for the Texas Avenue and 12th St. tunnel construction project in Washington, D. C.**

quirements, and other related phases of the project.

"When a downtown area project necessitates the use of sidewalk and street space for barricades in Denver, the layout is established on a diagram. We are fortunate in that our downtown streets are one-way, affording us an advantage in transitioning traffic flow. Construction sequence is phased so that not more than one lane is closed to moving traffic at any time in the downtown core area. In outlying areas, full street closures are sometimes allowed but only when traffic conditions and efficient detour routes will allow.

"The contractor in Denver is required to furnish and place all permanent type and temporary type barricades. Also, he furnishes all warning signs, delineators, flashing lights and any other safeguards that the Traffic Engineer might deem warranted. The Traffic Engineer installs standard signs prohibiting parking, establishing temporary one-way streets or restricting turning movements as may be required.

"As in many other cities, the contractor in Denver is advised to hire one or more off-duty uniformed police officers to regulate traffic during peak hours and to assist truck traffic to and from the project throughout the working day."

Dennis D. Kyrk, Assistant Director, Office of Traffic Control, Oklahoma City, Oklahoma, said that if an alley is available, the first area set aside is the half next to the project. If the contractor needs more room, the procedure used by Oklahoma's Traffic Control Office is to refer to traffic counts adjacent to the building project and to compare it with the street capacity. In this manner they determine the amount of street or number of lanes that can be barricaded for the project. In this area, usually next to the curb and one foot from the nearest traffic lane, the contractor must construct a protected walkway to serve pedestrian traffic. The minimum width of this walkway is five feet.

In addition, it must be lighted on the traffic side with red lights which burn continuously spaced approximately ten feet apart. An exception to this is when the paved portion of the roadway is not used; then the lights can be omitted on the protected walkway.

If the movement of traffic in Oklahoma City is critical, pedestrians may be restricted and detoured to the other side of the street. In this case, a protective wall will be built on the curb or street and the contractor will be allowed to use the sidewalk area.

In cases where the contractor needs more room than is allowed, the City Engineering Department is consulted to determine the minimum area required. This method, according to Oklahoma Traffic Control officials, has always worked, even in the core area.

Grand Rapids, Michigan, Civil Engineer, Richard Meernik, said that the traffic investigators work closely with the contractor concerned on all construction projects where the movement and safety of vehicular and/or pedestrian traffic are concerned. Off-street projects in Grand Rapids may require special measures to facilitate the movement of trucks and other equipment with respect to routing to and from the job site, and also actual access and exit from the site itself. This implies the use of designated City truck routes as far as possible.

Construction elevators adjacent to the street are inspected to make sure that vehicular and pedestrian traffic are adequately protected. Also, pedestrian walkways, in the street

● **PEDESTRIAN protection for multi-story construction in Portland, Ore. Passageway width at least 4 ft., height 8 ft. Canopy load capacity 125 lbs. per sq. ft.**

if need be, (covered if necessary) may be required in connection with demolition or new construction. These pedestrian walkways are required to be lighted both for pedestrian use and traffic warning purposes.

Projects involving street excavation in Grand Rapids are examined by the traffic investigators with a view toward preserving the safety and continuity of traffic flow, as well as that of pedestrian movement. Parking in the vicinity of these areas may be restricted with the permission of the investigator.

The contractor may obtain the loan of NO PARKING tripods from the Sign Shop of the Traffic Engineering Department by depositing $3 per tripod, and this money is refunded on the return, in good condition, of the tripods. Traffic cones may also be borrowed under similar conditions to guide traffic in the vicinity of an excavation.

Excavation in streets of Grand Rapids with heavy peak-hour traffic may be required to be covered with large steel plates (excavation size permitting) during these peak traffic hours. The larger excavations may need to have special detours arranged to bypass the area concerned.

H. L. Aitken, Director, Department of Highways and Traffic, District of Columbia, explained their program as follows:

"In our organization, the Traffic Planning and Design Division of the Bureau of Traffic Engineering and Operations has the responsibility of developing detour plans for construction, for the maintenance of automobile and transit traffic. Their detour planning takes into account the phasing of the construction operations so that construction will not be unduly delayed, but at the same time provide the minimal traffic service required. In those instances where the construction plans are prepared by consultants the plans are reviewed by our traffic engineer and revisions suggested if required.

"The traffic volumes to be served and the lane capacity required in the District of Columbia for such service are major elements in our planning. In some instances additional temporary lanes and connections are required for one phase of the construction operation, but during a subsequent phase when part of the new facility is usable they may be obliterated to make way for additional construction. Another factor that is decidedly helpful in keeping inconvenience to the driving public to a minimum is the excellent cooperation and coverage that our local newspapers, radio and television stations give us."

In the City and County of San Francisco, a booklet "Minimizing Traffic Interference Caused by Utility Work In Streets" serves as a guide for city and company supervisors directing projects in street areas. Although the pamphlet has been directed toward utility work, it is based on principles applicable in building projects wherever con-

(*Continued on page* 187)

WHAT YOU SHOULD KNOW ABOUT

ALGAE CONTROL

KENNETH M. MACKENTHUN
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Wisconsin Committee on Water Pollution,
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This article is based on a paper presented at a Seminar on Algae and Metropolitan Wastes held at the R. A. Taft Sanitary Engineering Center, Cincinnati, Ohio, April 29, 1960.

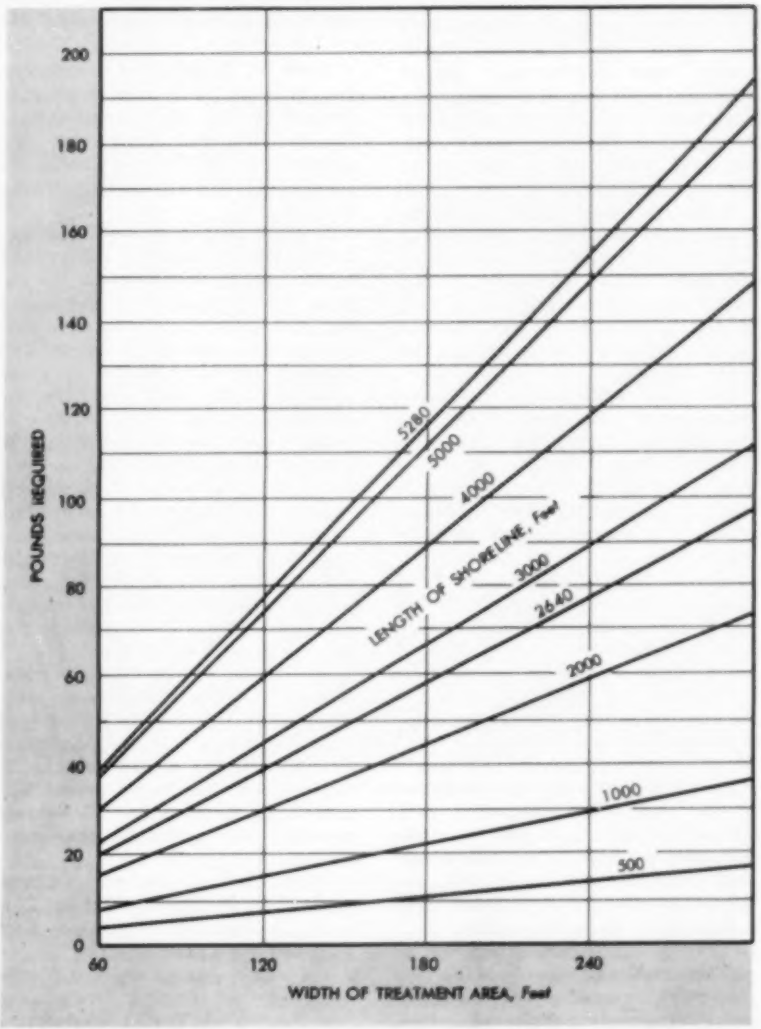
PROLIFIC and extensive algal growths cause much damage and hinder full utilization of water as a natural resource. Because of increasing demands placed upon our waters, adequate control of algal nuisances is of utmost importance.

An ideal algicide for adequate control must kill the specific nuisance plant or plants; be nontoxic to fish and most fish-food organisms at the plant-killing concentration but not seriously harmful to the ecology of the general aquatic area; and be reasonable in cost. Since 1904 (30), the chemical which has most nearly met these specifications for the control of algae has been copper sulphate. Despite its advantages, copper sulphate has shortcomings in that it may poison fish and other aquatic life in excessive concentrations, it may accumulate in bottom muds as an insoluble compound following extensive usage and it is corrosive to paint and equipment (4).

The practical use of tables of dosages specific for various organisms is difficult because of the many variables which one encounters in nature. Solubility of copper in water is influenced by pH and alkalinity, as well as temperature, and the dosage required for control depends not only upon these factors, but also upon the species or genus variation of the organisms and their resistance to copper sulphate.

A total alkalinity of 40 mg/L to methyl orange seems to be a natural separation point between soft and hard waters (32), and where the alkalinity exceeds this figure, lakes are treated at a rate of one mg/L of copper sulphate for the upper two feet of water regardless of actual depth. This concentration would amount to 5.4 pounds of commercial copper sulphate per surface acre. The 2-foot depth has been determined to be about the maximum effective range of a surface application of copper sulphate in such water since algae will be killed with increasing depth only if the rate of downward diffusion exceeds the rate of copper precipitation. The algae killed by such a treatment are those which are suspended near the water surface and which bloom in calm weather.

In lakes with a total alkalinity below 40 mg/L, a concentration of 0.3 mg/L commercial copper sulphate for the total volume of water appears best. This is about 0.9 pound of copper sulphate per acre foot. In applying this method of computing dosages, a low alkalinity lake with an average depth of about 6 feet, would receive a dosage about the same as a high alkalinity lake of the same area. When lesser depths are involved, the greater concentration of chemical is in the high alkalinity lakes. This apparent paradox would be even more striking were it not for the fact that in low alkalinity lakes, filamentous type algae may lie at the bottom, and, there-



● **DOSAGE CHART shows the amount of copper sulphate to apply to a given area.**

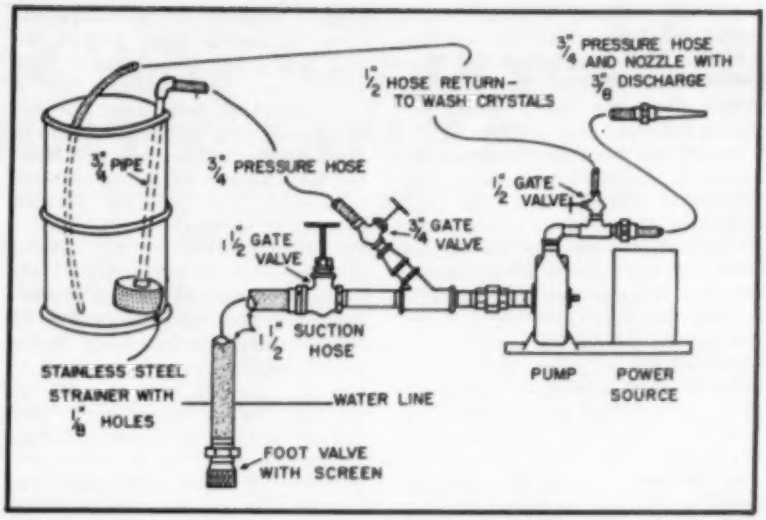
fore, the entire volume of water must be calculated to insure that a sufficient concentration of the chemical will reach the algae. In high alkalinity lakes, algae frequently are planktonic and tend to concentrate near the surface. When copper sulphate is used as the algicide, the best and most lasting control will result if the lake water has a total alkalinity around 50 mg/L or less.

Type of Application

Control treatments may be marginal or complete, and the type selected must be determined from the size, shape and relative fertility of the body of water, and from the estimated cost. Complete treatment in which the calculated amount of copper sulphate is systematically applied over the entire surface area is the most satisfactory. It insures that a major portion of the total algal population is eliminated at one time so that a long algal recovery period is required before a bloom condition may again occur. The interval of time between necessary treatments can be directly correlated with climatological conditions and the available nutrients utilizable by the remaining algal cells. One to three complete treatments per season may be sufficient to give reasonable control.

Marginal treatment is a method designed to obtain temporary relief in a restricted area where more extensive activity is not practicable or financially possible. It is a procedure in which a lane 200 to 400 feet wide, lying parallel with the shore, and all protected bays are sprayed in the same manner as for complete treatment. Other parts of the area are not treated even though much algae may be present. As a result of treatment, the algal population and the intensity of odors along the periphery of the lake are reduced. The duration of freedom from the algal nuisance following this type of treatment is dependent upon the density of the algal population in the center of the lake, and its ability to infiltrate the treated area through the action of wind, waves and currents. Marginal control operations should definitely be considered on a periodic repeat basis but may be justified as sufficiently effective, if fertility is not excessive and wave action is minimal.

Any algal control measure should be undertaken at the right time in the development of the algal bloom, and this is especially true in treating confined areas. If treatment is not applied until the algal cells have become dense, one must use good judgment in determining the extent of the area to treat at one time. Usually, it is a good practice to subdivide the area into sections in an attempt to control the nuisance in one section at a time. Other sections may be treated later to insure that sufficient dissolved oxygen is present to satisfy the demand of the decomposing algae.



● **EQUIPMENT** *for effective spray application of a solution of copper sulphate.*

Copper sulphate may be applied by bag-dragging, dry feeding (29), liquid spray (22) or by airplane in either dry or wet forms (14). Regardless of the method, rapid and uniform distribution of the algicide is essential. In general, liquid spraying systems operated from a boat or barge have thus far been most widely used.

Materials used in the construction of spraying equipment should be resistant to the corrosive nature of copper sulphate. These include red brass containing 85 percent copper and 15 percent zinc; commercial bronze, containing 90 percent copper and 10 percent zinc; stainless steel; and a good grade of copper. A more complete list of materials may be found in the *Chemical Engineer's Handbook* (1).

Equipment

Equipment used in spraying a corrosive chemical should be thoroughly cleaned in clear water following the spraying operation. This may be accomplished by spraying clear water at the end of treatment before the equipment is taken apart. It is most important that a residue of copper sulphate not be left in the equipment at the end of the operation, thus producing corrosion over a long period of time.

Essential spraying equipment can be fabricated for about $200. Crystalline or powdered copper sulphate is placed in the chemical solution tank to which water is constantly added and saturated copper solution bled into the suction line containing clear lake water, producing a 2 to 5 percent solution. This is discharged through a smooth fire hose nozzle which is continuously swept back and forth over the area receiving treatment so that good distribution is obtained. A small portion of the discharge solution is returned to the chemical solution tank to furnish dilution water for the crystals.

The selection of the pump which will exert the right pressure on a particular size of nozzle to produce the desired volume of discharge and spray combination should be given consideration. Early experiments (13) on fire hose and small nozzles supplied basic information on the distance of throw when the nozzles are operated under varying pressure. The first ½ in. of the tip of the nozzle should be reamed out in order to obtain a good stream.

Control of Application

The area of the spray pattern and the concentration of chemical solution as it leaves the nozzle determines the concentration in the receiving water. It thus remains for the operator to effect an even distribution of the calculated amount of chemical within a given specified area. This may be accomplished by adjusting the percentage of the solution sprayed with the diameter of the spray pattern and the speed of the boat. Acidified copper sulphate standards containing a 1, 2, 3, 5 and

8 percent solution of commercial copper sulphate should always be available for testing purposes. The test is made by collecting a small sample from the pump discharge, adding sufficient acid (powdered citric acid has been found easiest to handle in the field) to clear up the precipitate and matching the test color with the standard colors. Other methods include the use of the known pump capacity to determine that a given percentage solution will involve the distribution of a given number of pounds of copper sulphate within a given number of minutes. In this method, the speed of the boat must be regulated so that the entire area is covered in the specified time. Calculations can also be made using the average speed of the boat or barge coupled with the diameter of the spray pattern to determine the pounds of chemical which must be used in a given amount of time.

Within a few minutes after application of an algicide the color of the water will change to grayish-white. Although at no time are all the algae in the lake entirely eliminated (6), the water should be visibly free of cells two or three days following a complete application. In both Wisconsin and Minnesota (33), there is an indication that certain species of algae, particularly *Aphanizomenon*, seem to have acquired an increased tolerance to copper as a result of many years of treatment. Two to five times as much copper sulphate must now be used as was necessary some 25 years ago to achieve similar control.

The cost for the control of algae through the use of copper sulphate on high alkalinity lakes is in the neighborhood of one dollar per acre for chemicals, plus the cost of distribution for each treatment undertaken. The cost of distribution may range anywhere from 25 cents to one dollar per acre, depending upon the methods used in control and the circumstances surrounding the particular control project. In a liquid spray operation from a boat or barge, it is possible to distribute 300 to 350 pounds of commercial copper sulphate per hour of spraying time, thus covering about 60 acres per hour.

Toxicity

Much has been recorded on the toxicity of copper sulphate to various forms of aquatic life (9, 10, 27, 37, 39, 41, 45). Extensive field and laboratory studies have clearly shown that fish are not killed by copper sulphate at concentrations normally used for algal control, and that fishing and fish yields of lakes which have been treated over a long period of time have not deteriorated (33). It is well known that copper will accumulate upon the lake bottom following repeated treatments, and that the greatest amount of accumulation is found in the profundal region (34). Attention has also been directed to the possible deleterious effect of this accumulation on lake ecology (16, 42, 43). However, it has been shown experimentally that the accumulation of copper in bottom muds resulting from the use of nearly two million pounds of copper sulphate to control algae in a hard-water lake over a period of 26 years was considerably lower in concentration than the amounts determined to have a deleterious effect on the profundal bottom-dwelling organisms (25). More recent work (2) on this same lake has shown that the copper content is significantly less in the upper one inch of bottom mud than in the stratum six inches lower. Since this lake (Lake Monona, Madison, Wisconsin) has received reduced treatment with copper sulphate since 1947, and practically no control since 1953, this would suggest that the constant seepage of silt into the deeper areas of the lake will in time cover up the heavy concentrations of copper that were deposited during the years of continuous and heavy treatment.

There has been a constant search to find a chemical replacement for copper sulphate which would be more effective, non-accumulative and perhaps even less costly over an extended period of time (26, 36). Work has been done on Phygon XL (11, 12), which is rather selective for blue-green algae; on related naphthoquinone compounds which are believed to be less toxic to fish; and on delrad (dehydroabietylamine acetate) (19, 20). In all cases, the cost of treatment of a large area with these newer algicides has thus far exceeded the cost of using copper sulphate (17), and none has made up the difference in the amount of control offered.

State Control

Recently, a questionnaire was sent to each state to obtain information on aquatic nuisance control activities. About 40 percent of the states regulate the introduction of chemicals for the control of aquatic nuisances by statute or by executive order and require a permit for the introduction of chemicals into public waters. About 57 percent of the states report complete supervision of field application of chemicals, and an additional 21 percent spot check on field applications.

Although 21 states report the use of copper sulphate for the control of algae, the greatest large-scale use is apparently confined to the midwestern lake states. Minnesota, in 1959, reports the use of 221,745 pounds of copper sulphate in the treatment of 17,574 acres of water. In Wisconsin, 6,270 acres on 29 lakes received 54,765 pounds of copper sulphate for algal control. Other states report the use of lesser amounts.

Wisconsin is the only state with a long-standing statute pertaining specifically to aquatic nuisance control, and the only state which assesses a fee for permits and a definite rate of charge for supervisory service. To set up a project, an application for permit and a $10 application fee is filed, after which it is determined if there are any objections on the part of citizens to the proposed chemical application. A hearing is appropriate to judge the validity of objections and the permit is granted, rejected, or modified. Upon receipt of a permit, the sponsoring party may hire one of the commercial operators who will carry out treatment in accordance with a specified and preapproved plan, and the application of chemicals must be supervised by a representative of the Committee. There is a charge of $8 per hour for this supervisory service, or a minimum seasonal charge of $20 if the seasonal supervision requirements do not exceed two hours of supervisory service.

Bibliography on Algicides

In keeping with the summary nature of this article, a rather complete bibliography on algicides has been prepared with emphasis on the use of copper sulphate. Appropriate citations are referenced in the text.—Ed.

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(*Continued on page* 158)

A Better Way to Survey UTILITY LINES

Closed circuit television which uses equipment reduced in size and power requirements offers a new and practical approach to the inspection of small diameter sewer and drainage lines. Inspections prior to and following the repair of a line subject to excessive infiltration demonstrate the usefulness of this modern inspection method.

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**Chief, Sanitary Section,
Corps of Engineers,
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ENGINEERS and inspectors have experienced difficulty in determining the condition of a storm or sanitary sewer line, source of infiltration or a defective joint. Often when defective joints are found a hundred feet or more from the nearest manhole, many inspectors have wished that parts of "Alice in Wonderland" were true and one could change size at will. Through the magic of closed circuit television, it is possible to obtain the advantages of becoming small like "Alice" for this close-up view without danger and discomfort.

Use of closed circuit television for inspection of lines was an expected development for, with the reduction in size of equipment and decrease in power requirements, it became practical to house the camera in a waterproof cylinder small enough to use in eight-inch lines. By controlling the light intensity and location of the camera, clear, well-defined pictures of the interior of every pipe section is obtainable.

First, a flexible cable is pulled between manholes; then the cable is attached to the front and rear of the camera sled. Both ends are secured to permit movement back and forth as desired to view the pipe from different positions. A tape attached to the camera sled facilitates accurate location of each joint.

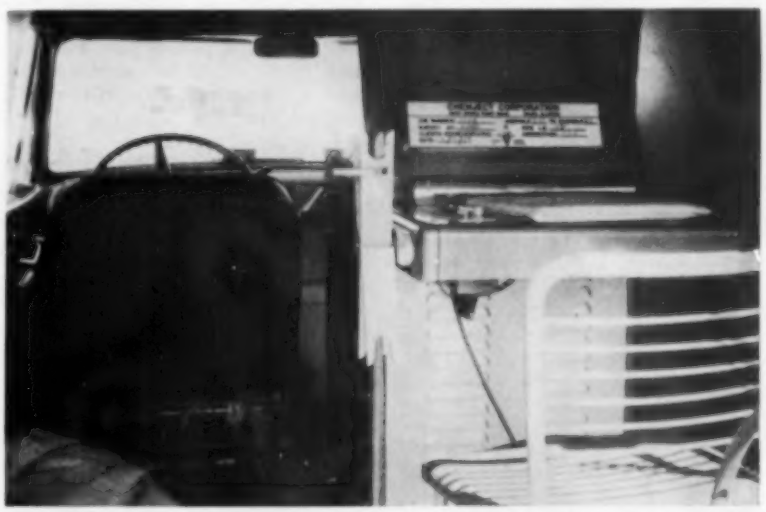
Alternate methods of inspecting the interior of a small sewer are: 1) By reflecting sunlight through a section of line between manholes and observing the condition of the line as reflected in a mirror from a position on the surface of the ground at the manhole opening; 2) by entering the manhole and making a direct visual check of the illuminated interior of the pipe. Only if the point of defect is located a few feet from the manhole, can the details be reasonably well determined and in many cases, accurate location of the defect is difficult.

A more recent development has been the use of a sequence camera in a watertight container with a strobe light and robot control. Pictures are taken at regular intervals and the distances to the camera obtained by means of tape are recorded. This procedure, although a step forward, does not possess the flexibility of the closed circuit television.

Advantages of using a closed circuit television camera for sewer repair and inspection work was dramatically illustrated in the efficient repair of gravity sanitary sewer lines at Homestead Air Force Base, Florida, by the Jacksonville District, Army Corps of Engineers. Approximately 7½ miles of sewers which had been constructed about six years previously were subject to excess infiltration. The lines were constructed in very porous limestone at depths to eight feet below ground water level. The porosity of the rock made the limestone an excellent aquifer and dewatering the trench, even for short sections, was quite difficult. Lines were constructed with alternate joints of bituminous material poured on the bank and diaper joints of cement mortar poured in the trench. Upon completion of construction in 1953, the system was checked for infiltration and was found to be less than 75,000 gallons per day.

The Corps of Engineers made a survey of infiltration a few weeks prior to repair work and found it to be about two million gallons per day.

Municipalities and subdivisions in the vicinity of Homestead Air Force Base have frequently experienced similar difficulty with infiltration in sanitary sewer systems. The porous limestone, the water table near the surface of the ground, the difficulty of dewatering and related problems are common to much of the lower east coast in Dade and Broward Counties. In the majority of these developed areas, the sanitary sewer lines were satisfactory at the time of final inspection of construction but following a period of five to ten years, excessive infiltration has de-



● **INTERIOR of truck unit used in closed circuit television, showing screen in upper right corner. Such a unit permits easy inspection and quick repair of lines.**

veloped. Conventional methods of excavation and dewatering for repair of leaking joints were not only difficult but also expensive.

Prior to preparation of plans for repair of the sewer lines at the Homestead Base, several contractors who specialized in this type of work considered the difficulties of accurately determining line condition. The possible use of closed circuit television was discussed and several contractors indicated their interest in this equipment. At least three of the bidders on this work informally advised that they proposed to use television. The successful bidder on this work was Marbaugh Construction Company, Fort Lauderdale, Florida.

Repair of the sanitary sewer system consisted of removal and replacement of 900 ft. of 8-in. and 830 ft. of 24-in. pipe, repair of 22 leaks by excavation and repair or replacement of pipe and 88 leaks by chemical grouting. Chemical grouting was accomplished by the subcontractor, Chemical Soil Solidification Company, Chicago, Illinois. Accurate location of leaks made chemical grouting effective and permitted visual inspection of results. The contract unit price of repairing each leak by chemical grouting was $250. Total cost of this work, including

● **ELECTRIC motor and pulley has been set up for pulling camera through sewer.**

modification of one sewage lift station to provide additional capacity, was $83,866. Repairs were completed over one year ago and a comparison of meter readings at the water treatment plant and the sewage treatment plant shows that infiltration was satisfactorily reduced, and remains within acceptable limits.

Use of closed circuit television for future inspection and repair of sewer lines will probably increase as more engineers have the opportunity to observe the equipment under field conditions. Quality of sewer line construction will tend to improve if the contractor is aware that the sewer line interiors can be checked for alinement, grade and

● **CAMERA used by the contractor in the work described in this article. Camera sled is pulled back and forth by cable while attached tape locates areas at fault.**

defects of construction. Closed circuit television survey equipment has been used effectively to settle responsibility for infiltration and causes of excess infiltration in a sanitary sewer system by taking photographs of the television screen and by supplying related data.

Organizing and Operating a Technical School for the Water and Sewerage Field

GEORGE FERREL,
Supt. of Public Works
Liberty, Missouri

MORE THAN a year of planning and hard work culminated in the establishment of the Missouri Water and Sewerage Technical School in Neosho, Missouri, during the first part of January this year. Sponsored by the Missouri Water and Sewerage Conference, the success of the school has exceeded the expectations of all. Particularly well pleased is the director, Lloyd Caughran, whose vision, determination and tireless efforts have made a reality of what is apparently the first attempt to establish and operate such a school.

Mr. Caughran, who is Waterworks Superintendent of Neosho, conceived the school which is established in a former Hobby-Craft building on nearby Fort Crowder. He and his wife have given generously of their time and means, without pay, to crystallize and put in operation this project. For this, he received the "Award of Merit" of the Conference for 1959.

The Conference, parent organization, consisting of about 850 members has, as its current chairman, Lawrence E. Martin, Office Manager of the Missouri Water Company of Independence, Mo. Others who have helped include the Missouri Division of Health, The Missouri Water Pollution Board, the American Waterworks Association and The Missouri Section, AWWA.

At the school instruction is divided into three phases or classifications. 1) Lecture, providing classroom and text instruction; 2) laboratory, for chemical and bacteriological analyses; and 3) mechanical laboratory. The last provides one of the most popular and most needed types of instruction. The classroom for this phase of the school is about 24 x 40 ft. and is filled almost to capacity with valves; hydrants; main tapping and cleaning equipment; chlorinators and associated apparatus; pipe pushing equipment; gas meters; meter setting and testing equipment; and many other mechanical, maintenance and installing devices commonly used. Many of these are cutaway models, loaned or donated to the school without charge to be inspected, taken apart and reassembled and used in classroom instruction.

Instructors for the school are

(*Continued on page* 186)

ORGANIZING A SEWAGE EFFLUENT UTILIZATION PROJECT

PAUL W. TRAVIS

FOR YEARS the coastal farmers in the Talbert Valley in Southern California had experienced increasing anxiety over the continued availability of water for irrigation. Diminishing ground water reserves with consequent encroachment of sea water resulted in one after another of the wells turning salty. The presence of a nearby sewer outfall from the Orange County Sanitary District's primary sewage treatment plant led to consideration of using this source of water some years ago. The County Farm Bureau conducted hearings and made investigations in 1950 on the possibility of reclaiming sewage for irrigation of crops, working with County Water District Officials and County and State Health Departments. A research project was set up using a plot planted with lima beans. Production was satisfactory and it was concluded that Orange County effluent could be employed for irrigation.

Effluent spreading operations on a 54-acre field were commenced in 1952 and continued for three years. The effect of using settled sewage on the soil, crops and ground water was studied, the soil being tested at 25 points. The composite samples were checked for pH and conductivity at depths ranging to 5 feet, before and after spreading. Sewage was applied in daily quantities of about one mgd while the land was refurrowed. This was continued during August to September, 1952, and July to November, 1953. No significant changes in pH were noted, but conductivity increases occurred. It was concluded that the latter would not increase beyond the conductivity of the applied sewage because of leaching of the soil.

Following these successful tests, an agreement was drawn up in March, 1954, between the Orange County Sanitation Districts (the various sewer districts of the county in which Talbert valley is located) and about 30 owners of 2,250 acres of land in the valley, setting forth the rules governing the taking of effluent from the district's lines for irrigation. The owners were given the right in the agreement to transfer their interest to a possible water district. It was stipulated that the price to be charged for the effluent initially would be 50 cents per acre ft., and that the price could be renegotiated at 5-yr. intervals, with a top price of $2.50. After the agreement was signed, final arrangements were completed for the development of plans for an irrigation system.

The Talbert Water District was formed, and on October 24, 1954, the farmers of the valley unanimously passed a bond issue of $275,000. In August, 1955, the district asked the County Water Pollution District for an industrial waste permit. This was issued with certain construction requirements as to the reservoir, cross connections, pipelines and effluent chemical limits.

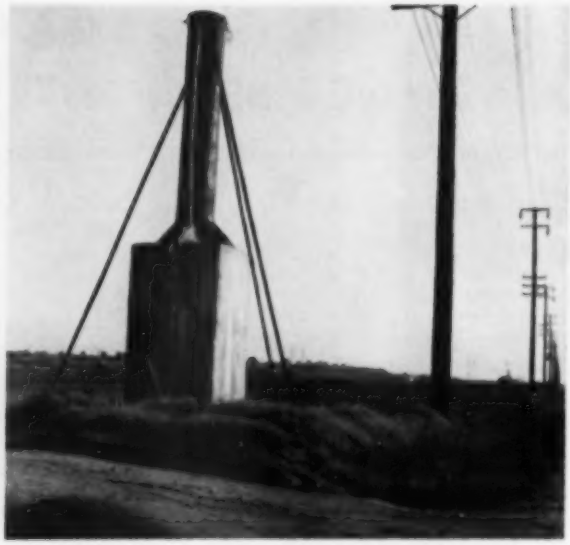
The county health department was queried in the spring of 1956, as to the use of effluent on certain crops. A meeting was called to which all interested in the irrigation plan were invited. Plans for construction and operation were jointly developed between the Talbert Water District Board and the Health Department.

In general the agreement covering the use of the effluent had the following requirements: The reservoir will be drained and cleaned regularly; a skiploader will be used to remove accumulated sludge; and a well or water tank will be provided to supply fresh water flushing. A portable trash pump will be used to pump the flush-water back into the outfall.

● SCUM IS piled up on semi-empty reservoir by the wind. Deposits on reservoir slopes are mostly seeds and dried scum.

● THREE pumps lift sewage effluent from outfall line to standpipe for gravity flow to reservoir for irrigation use.

● **CARETAKER opens gate to let irrigation water on farm land. Standpipe shown contains meter for measuring the flow.**



● **A CITY water supply well is in irrigated area. Land around well for 100 ft. is plowed and irrigation prohibited.**

Dead ends of each branch lateral will be drained into the Talbert Drainage District's lines. No effluent will be used within 100 ft. of any home service or private domestic water lines. Abandoned wells will be completely clay filled. The irrigation district lines will be used solely for effluent.

Portable steel signs stating in English and Spanish "Sewage Water, No Drinking or Bathing" will be placed around the irrigation district area. (It has since been decided that it would be better publicity to call it "reclaimed water.") The zanjero, or caretaker, will be responsible for water control, except on private land, where the farmer is responsible To prevent odor there will be no surface ponding nor sludge accumulation in the area, nor in the reservoir.

Only crops approved by the health department will be irrigated. All vegetables will be pre-irrigated only, except chili peppers that are to be dehydrated. These may be irrigated within 30 days of harvesting; more recently tomatoes are permitted to be pre-irrigated. Field crops may be watered provided no milk cows are pastured where the ground is moist. The crops approved for irrigation with settled sewage were alfalfa, sugar beets, dried beans and dried peppers. Each farmer was expected to report through the District to the Health Department of the crops he was to grow.

In the fall of 1956, the Water District began on its effluent irrigation project. The Sanitation Districts arranged at its treatment plant to send down the outfall line, from which the water was to be taken, only domestic sewage effluent. Waste coming to the plant from a line carrying salt water from oil fields and chloride, boron, ammonia and carbonates from commercial plants was routed down another outfall.

To further protect the land from salts, the sewage treatment plant arranged to test continually the effluent for suspended solids and salts. A meter in the treatment plant laboratory continually measures the amount of salts, and whenever soluble salts register more than 1800 mg/L, the effluent is cut off and rerouted down another outfall.

To make the effluent available, the water district tapped the outfall and installed three pumps which discharge into a standpipe. From this the effluent flows by gravity into an equalizing reservoir. The pumps are alternated according to demand and are monitored by a conductivity meter which shuts them off in case the salt content becomes too high. They also are automatically cut off when the reservoir is full or if the flow in the outfall is too low.

The gunite-lined equalizing reservoir has a capacity of 8 acre-feet. The water is pumped out of the reservoir into the irrigation system's 27-in. main trunk line with two pumps, one with a 10-hp motor, and the other with a 25-hp motor.

The trunk line has a mile of 27-in. and a mile of 24-in., spun-concrete, rubber-gasketed jointed mains. Each half mile there is a north and a south lateral. The flow of water into the laterals is controlled by gates at the junctions. The laterals are from 3800 to 7500 ft. long. The available head varies from 7 to 14 ft. Consumption is registered individually by meter, at the respective intakes.

The system is designed so that the lines are always full (with a bypass into the reservoir) to maintain a constant hydraulic head on the booster pump. There are over 40,000 ft. of concrete pipe in the laterals, varying in diameter from 14 to 24 inches. Each branch line can be drained. The capital cost came to approximately $100 per acre.

Corrosion by sulfides is of great concern, and while the objective of the design was to maintain a velocity of more than 2 fps, there are several lines where such a velocity cannot be maintained. There is also a problem with odor. Alamask is dripped from the spigot of a 5-gallon can into the water at various pipe junctions and is also used in the reservoir.

Reaction to the Project

The valley farmers seem to be satisfied that this is a worthwhile project. Last year, two more farmers, with a total of 140 acres, paid up their share of the back costs and agreed to the price of $6 per acre-ft. to get the effluent piped to their highest lands. This year five more, with 240 acres, are starting to take the water.

There are now about 2800 acres under the system. It is the belief of the farm advisor that crops can be doubled with the incidental application of the added nutrients.

MUNICIPAL POWER PLANT saves $80,000 per Year

RAY GREENLEE
Superintendent, Power Plant
Kimball, Nebraska

DUAL-FUEL operation and the building block system of public power have paid dividends to the city of Kimball, Nebraska, averaging about $80,000 a year from 1952 through 1959. Our modern municipal power plant is the sole source of power for a community of 5,000 in the southwestern part of the state and for the oil wells that helped bring us real prosperity, wells that now number 22 within the city limits alone.

Private high-fine utility rates for Kimball would average about 15 mills per kwh, but our home-owned plant has supplied all the required electricity at an average of 6.2 mills per kwh for the past three years. When applied against last year's production figures of 11,748,900 kw, this represents a saving of over $100,000.

In 1951, to supplement our 1,040-kw capacity, the city decided to expand its power facilities rather than buy from an outside source. We installed a 900 kw White Superior engine-generator set rated at 1,400-hp and designed for dual-fuel operation.

Within four years the demand had risen so sharply that we added another White Superior, this one rated at 1,000 kw and also dual-fueled. A third Superior was added in 1956, bringing the plant's firm capacity up to 3,175 kw and providing what appeared to be a comfortable cushion against future expansion.

The peak load in 1956 was 1,850 kw. Since Kimball had not planned to meet this peak until 1965, it became obvious that the power schedule would have to be up-graded at a later date. In 1957 the peak became 2,150 kw; it jumped to 2,450 the following year, and in 1959 it stood at 2,700. The cushion was no longer comfortable.

Negotiations were therefore reopened last year to add some power padding. They concluded with the purchase of a pair of 1,250 kw units, and again the order went to the White Diesel Engine Division of the White Motor Company.

Before the engines could be installed, there had to be some juggling of space to accommodate the new power units. This was resolved by adding a 28 by 42-ft. bay to the present building. New General Electric console-type switchgear was placed in the bay, and one of the three vintage engines was removed. The new engines were moved into the spots formerly occupied by the old engine and old switchgear.

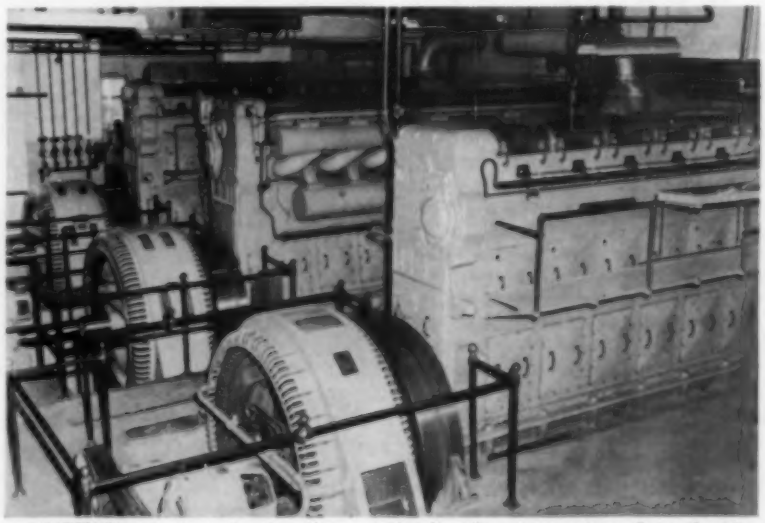
First of the new supercharged engines was placed on the line in January, and the second was put into service at the end of April. The firm capacity of the plant is now 4450 kw from five Superiors and one American Locomotive.

The ability to add new power units when more power is needed is the main point of a building-block system, and Kimball provides an excellent example. Even with amortization of the engine prices included, the kwh cost is still less than half of the private utility rate.

Another advantage to the system is that the six generators offer combinations of output to match the exact requirements at any time—night or day, Monday or Sunday. There is no wasted horsepower; and locally-generated power is easier to control in case of emergency.

As for dual-fuel operation, the switch from full diesel to take advantage of the natural gas resources of the area has brought further economies. At 13 kw per gallon, 903,762 gallons of diesel fuel would have been required to achieve the 1959 production. The cost would have been $103,932. The actual cost for 87,530 gallons of fuel and 120,916 mcf of natural gas last year was $44,359, a saving of $60,000.

Our new engines are equipped with Elliott generators and exciters; Woodward governors; Airco air filters; Young radiators and shell and tube air coolers; and Bendix-Scintilla fuel injection equipment. Other items of accessory equipment were supplied by the contractor, B. C. Bunn of Clarion, Iowa, with the recommendation and approval of the White Diesel Engine Division.



● **INTERIOR of plant showing three of the five Superior engines. Supercharging and use of dual fuel have resulted in marked economies. Firm capacity is 4450 KW.**

Landfill Operations

WHEN BACKYARD incineration of refuse was banned by enactment of an "anti-smog" ordinance in October, 1957, nineteen county sanitation districts of Los Angeles, California, were ready to put into full-time operation two sanitary landfill areas which had been activated several months before. The Districts had plans underway for opening additional sanitary landfills and for the construction of a transfer point known as South Gate Transfer Station.

Originally responsible only for handling sewage disposal matters, the districts had, as early as 1949, been preparing for the day when they might have to take over refuse disposal matters. Recommendations from a study completed in that year and a more detailed presentation in 1955 were approved by the Districts Board of Directors. All necessary legal steps detailing responsibilities, arranging financing and providing for acquisition and operation of sanitary landfill sites, transfer stations and vehicles were taken.

The sanitation districts jointly serve more than 3,000,000 persons in 57 cities as well as a number of unincorporated communities in an area covering more than 650 square miles.

Refuse is handled today at three landfill sites. Fill No. 1, south of Los Angeles, is in a mined-out open pit covering an area of approximately 146 acres and averaging 90 to 100 feet in depth. Fill No. 2, east of Los Angeles, covers 192 acres in an area of rolling hills near the City of Pomona. Fill No. 3, west of Los Angeles, covers 385 acres in the Santa Monica mountains. First lift in each is approximately 30 feet, with the finished fill to be approximately 80 feet in depth at No. 1; 75 feet in depth at No. 2; and 350 feet in depth at No. 3. No. 1 site is filling at approximately two percent per year; No. 2, at approximately three percent; and No. 3 has just started operations.

Sites are operated as ramp type landfills, with refuse delivered to the bottom of the working face. It is pushed up, placed, compacted and covered with earth by Caterpillar D8 Tractors equipped with bulldozer blades. Refuse is deposited in lifts about 30 feet high and four feet thick, measured perpendicular to the face of the ramp, which is maintained at about a 5 to 1 slope. A 12-inch layer of dirt is compacted over it at the end of each day's operation.

● **CUTAWAY model of landfill area helps in planning. Left to right: Lester Haug, division engineer; C. R. Compton, chief engineer; and F. R. Bowerman, assistant chief.**

Track rolling by the D8s accomplishes the primary compaction of the refuse with the earth cover compacted by the application of water and travel of refuse vehicles and earthmoving equipment. Cat 80, Cat 435 and LaPlante-Choate scrapers towed by D8s are used to spread the cover on each day's cells, with tractor-mounted rippers being used where necessary to facilitate excavation. Water wagons of 1,500 to 3,000 gallons capacity are employed to control dust at each site and Cat No. 12 Motor Graders maintain haul roads and finish-grade the tops of the fills.

The No. 1 site currently processes approximately 20,000 tons of refuse

● **TRANSFER station at South Gate. Refuse brought to this site by local haulers is transferred to district's 23-ton trailers for movement to the land fill areas.**

by Los Angeles County

● **TRACTOR spreads load of refuse brought by Pomona truck at fill No. 2. Refuse is placed in lifts 30 ft. high and 4 ft. thick; ramp is maintained at 5:1 slope.**

per month, with about 8,000 tons handled at No. 2 monthly. All-weather operation is made possible through paved access roads and turn-arounds on top of the working areas, in addition to provision of adequate drainage.

Collection of the refuse is left to each local agency to handle as it chooses and the landfill areas may be utilized by both public and private haulers.

If the refuse collector is too far away from any of the landfills for economical direct delivery of refuse, he may use the South Gate Transfer Station, where his load of refuse is transferred to one of a fleet of extra-large truck and trailer units owned by the Districts. These units have a legal capacity of 23 tons, which lowers the cost per ton to an economical point for the haul. Average refuse collection vehicles have a capacity of about three or four tons.

Fifty-ton capacity, 60-foot-long Fairbanks-Morse scales equipped with dials graduated in tenths and hundredths of a ton are used at both landfill sites and at the South Gate Transfer Station. Printomatic devices print the weighing information on tickets. In effect, the dial is graduated in dollars and cents, since the charge for refuse handling is $1.00 per ton. Upon arrival, a truck is gross weighed and that amount is printed on a three-copy ticket. Leaving empty, the truck is again weighed and the net difference in weight is noted. Should the net difference be 1.19 tons, for example, the trucker's charge would be $1.19.

A unique feature employed at the sites and at the transfer station, and one which is saving both time and effort, is the use of credit cards. On approval of credit, the person, companies or agencies delivering refuse regularly to any of the three weighing stations are issued plastic, embossed credit cards. Each card is issued to a specific truck; information on the card includes the name and address of the operator, his account number and the tare weight and number of the truck. The card holder is billed monthly; and, most important, the truck does not have to be weighed on leaving, thus saving considerable time.

Landfill areas work on an 8 a.m. to 5 p.m schedule, the No. 1 and 3 sites working six days per week and the No. 2 site seven. Six employees work at No. 1 and 3, and three at No. 2. Over-all supervisor for all sites is F. R. Bowerman, assistant chief engineer and general manager of the districts, with Lester Haug, industrial waste division engineer in immediate charge.

All costs, including that of the land, are being covered by the $1.00 per ton charge. Cost of the land and site improvement vary at each of the three sites; depreciation of equipment is 23 cents per ton; operation and maintenance, exclusive of equipment, is 43 cents per ton; and billing and accounting is 11 cents per ton.

When the landfills are completed, the sites will become county-operated regional parks with golf courses and other recreational and cultural facilities.

● **TRANSFER truck is unloaded by tractor. Cables are laid in bed of trailer and covered with refuse; ends are then placed on top of load; pull by tractor unloads.**

HOW INDUSTRY PROMOTES WATER CONSERVATION

L. T. DAVIES
Manufacturing Staff
General Motors Corporation

Mr. Davies presented this paper at the Ninth Southern Municipal and Industrial Waste Conference, North Carolina State College, Raleigh, North Carolina. The author acknowledges the generous assistance of General Motors Corporation engineers, particularly C. A. Collins and L. Tangen of Pontiac Motor Division; A. Burdick of AC Spark Plug Division; A. Beebee of Rochester Products; A. McCurdy of Fisher Body Division; and T. Fadgen of Ternstedt Division.

IN INDUSTRIAL waste treatment, return of waters to a stream in such condition as to cause no difficulties to downstream users is definitely a major factor in water conservation. As a Vice-President of General Motors recently said, "Industrial people have an additional responsibility to the states and to the country as a whole. This responsibility is to return to the streams, process water which can be used by others, and they must make sure, therefore, that no harmful materials are discharged with it."

In-plant practices to conserve water fall into four general categories:

I. Reduction in use involves practices designed to reduce withdrawal from the water supply by reducing the amount of water used for a particular operation. For example, large volumes of water have been used for rinsing purposes after the various cycles in electroplating. Optimum rinsing requires that the least amount of water be used to provide a surface with minimum acceptable contaminants. Optimum rinsing also requires that the least amount of contaminants be carried out with the parts so that the rinses can do their job with the minimum amount of water. This can be done by good drainage preferably over the solution or over a reclaim tank. Racking of parts and the design of parts also affect good drainage.

Rinse water requirements can be greatly reduced by modifying the plating machines so that racks are withdrawn from the plating solution two or more stations ahead of the exit. Timed fog sprays rinse the parts with water as the racks leave the plating solution. This water, containing the rinsed-off plating chemicals, drains directly into the plating bath. An interesting point is that the volume of water sprayed is maintained at a rate to equal that of evaporation of the plating solution.

Several types of flow controls can be used to insure that only a stipulated flow of rinse water is used. Orifice plates can be installed to regulate the water flow. The use of such plates is simple, effective and economical. There are controls commercially available which permit only a regulated flow even though the pressure changes.

Conductivity devices for controlling water input to rinsing operations are in common use throughout GM. One Division, formerly using 700,000 gallons of water per day in plating operations, has made a reduction to 300,000 gallons per day after installing conductivity controllers. This amounts to annual water savings of over 100,000,000 gallons. The devices measure the conductivity of electrolytes in the rinse.

When the conductivity rises beyond a predetermined level—that is when the concentration of contaminants exceeds the acceptable limit—a solenoid controlled valve opens permitting water flow. Good maintenance of the probes is essential to continuing success with these units. They can be supplied as single or as multiple units serving up to 12 different tanks.

Counterflow or counter-current rinsing is being employed at an increasing rate throughout the Corporation. In this method, applicable to two or more tanks in series, the rinse water added enters the tank farthest away from the process tank and flows counter-currently from tank to tank. By using this method, parts receive a final rinsing with the cleanest water in the last rinse. The quantities of water required are greatly reduced.

All these methods can be practiced not only in plating systems but in any process which uses rinsing.

II. Recirculation of water in a closed system is a second category. One way to accomplish a large reduction in water usage is by re-

● **WATER conservation slogans posted in manufacturing areas remind plant personnel of the conservation program by stressing the importance of water to their jobs.**

circulation of water used for cooling purposes. The water is usually passed through a cooling tower to remove absorbed heat. Such systems are employed on air conditioning units, air compressors, welders, die casting machines, furnaces, hydraulic oils and in similar applications where water is required for cooling.

III. Re-use is a third category. Water used for cooling purposes where a recirculating system is not employed can often be used for a second purpose or even more. For example, cooling water passed through a heat exchanger can often be used as process rinse water. Similarly, cooling water from vapor degreasers used for cleaning metal parts is a source of water for secondary use. An interesting re-use of water is the use of the effluent from an industrial waste treatment facility for cleaning equipment, dissolving chemicals and other uses in the waste treatment operation. A challenging problem is to find methods to put such effluent to greater use.

IV. Substitution is the use of alternate methods which can replace the use of water. A striking illustration of what can be done was the substitution made by one Division, of direct expansion refrigeration in place of cooling water. Cooling water was formerly used to cool the brazing furnace atmosphere gas after generation. The water vapor remaining in the atmosphere gas mixture after cooling with 70°F or 85°F water required enrichment with a higher quality gas in order to gain a 40°F required dewpoint. The direct expansion aftercooler maintains the required dewpoint eliminating the use of water for cooling on this operation—an annual saving of 100,000,000 gals. — and eliminating the expense of the high quality gas used for enrichment.

An Approach to Water Conservation

Elements of an effective water conservation approach are: 1) Responsibility for the water conservation program; 2) water use survey; 3) follow-up; and 4) cooperation of plant personnel.

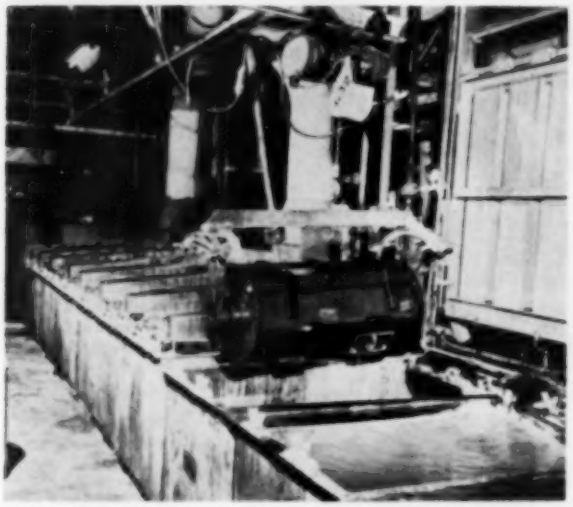
The responsibility for water conservation should be well defined whether a one-man responsibility or a departmental responsibility. Necessarily, management's active support and assistance are essential.

A survey to establish water usage is a necessity to any water conservation program. Water meters can be used effectively to provide data on water consumption, particularly if meters are installed for each component of a process or operation using water. After the survey has been instituted the requirements for water can be determined and water conservation practices can be established. At this time an appraisal of process operating conditions should be made. Many processes requiring cooling may perform at a higher temperature than formerly considered acceptable. This means lower quantities of water are required. Similar water savings may be made after a thorough re-study of process requirements. The water survey should also reveal where water is being wasted through leaks. An effective preventive maintenance program can result in a considerable savings of water.

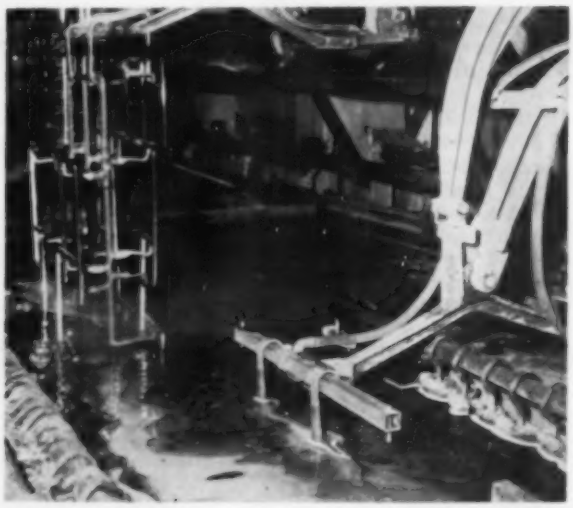
A continuing follow-up is required to maintain the results achieved by the adoption of water conservation practices. A nightly and weekend check to guard against water waste should be made. At intervals each applied water conservation practice should be reviewed to determine if anticipated benefits are being realized—and, if not, to study and correct the condition.

Perhaps the most important and certainly one of the most difficult phases of any water conservation program is to have plant personnel recognize the need for the program and cooperate to achieve successful results. One Division has posted signs in manufacturing areas to remind employees of the value of water conservation.

Intra-departmental cooperation can be gained by forming a "Water Conservation Team." Meeting frequently, this team, with representatives from plant engineering, production, laboratories, process engineering, etc., can review problems arising in the program and take immediate action. Informal discussion may bring out other areas where water conservation can be applied. One Division having such a team has reduced annual water requirements from 629,000,000 gallons in 1955 to 227,000,000 gallons in 1959. This is a reduction in annual usage of 402,000,000 gallons from 1955 to 1959.



● **DRAINAGE** of this plating barrel over a reclaim tank reduces the amount of contaminant and so cuts rinse water use.



● **FOG SPRAYS** shown at left side of picture wash plating solution from racks. Spray volume equals loss by evaporation.

COMPREHENSIVE TREE REPORT MAPS PROGRAM FOR DUTCH ELM DISEASE CONTROL

Because of the threat of Dutch elm disease to street trees in the City of Iowa City, a forestry department was established and the first City Forester, Raymond F. Bruns, was appointed in May, 1959. This article is based on a "Comprehensive Tree Report" prepared by Mr. Bruns and submitted to City Manager Peter F. Roan. The report, which contains complete census results, analysis and evaluation and suggested street tree programs, was forwarded to us by S. W. McAllister, Jr., Administrative Assistant to the City Manager.

THE FIRST step in developing a street tree program was to conduct a census to determine the number of trees, species, size-class, location and conditions and needs for planting, spraying and removal.

An exact count of street trees was made listing each tree by species; locating as to section, street and address; grading as to A, B, or C and marking as to needs for pruning, spraying or removal. All of this information was compiled and tabulated. A count of privately owned trees was made largely for public information and to supply a public-to-private tree ratio. This also provides an indication as to the preference of the people in past plantings and gives a more complete picture of the total elm population and the problem facing the city when the Dutch Elm disease arrives.

The tree census data indicates that 5,139 trees were marked to be pruned. Spraying was slated for 4,363 trees, which includes 4,021 elms with a dormant DDT spray for Dutch Elm prevention. Removal was recommended for 439 trees. There were found a total of 364 stumps that extend from three to thirty-six inches above ground level.

Trees were marked for removal for one or more of the following reasons: 1) Hazardous condition; 2) poor location as to street intersections, sewers, power lines, etc.; 3) crowded and thus poorly formed; and 4) undesirable species for street plantings, such as poplars and boxelders.

The stumps create an unsightly situation, are hazardous to pedestrians and present a good breeding place for the Dutch Elm bark beetle in elm tree stumps. All existing stumps should be removed and action taken to require all future tree removals be made below ground level.

Most small trees have a "replacement value"—the actual cost of planting a tree of the same size and species. But how can a medium or large tree be evaluated where replacement would be impossible? Trees of these sizes have taken 25 to 100 years to reach a point where they give service, beauty and utility. It is impossible to evaluate time but it is possible to evaluate a tree that has substance. This section is an explanation of the method used to evaluate medium and large trees and to estimate the value of existing street trees in Iowa City.

In determining the monetary value of shade trees, three basic factors must be considered. These are: 1) Size, 2) kind or species, and 3) condition of the tree. It is the belief of the National Shade Tree Conference that the area of the cross-section of the trunk at a point breast high (4½ feet above ground) is the best means of expressing the size of shade and ornamental trees when a value related to size is to be determined. It is also the opinion of the Conference that the value of a perfect specimen tree is $5.00 per square inch of trunk cross-section.

Very few shade trees are perfect specimens. As trees become large and old they often become defective in one or several ways. The person making the appraisal must consider the condition of the tree and judge how nearly each tree approaches a perfect specimen. In making the street tree survey, the best trees were designated as "Class A" or 100 percent perfect; those with some defects but still basically sound as "Class B" or 80 percent perfect; and unsound or undesirable trees as "Class C" with little or no value.

● **STREET tree scene, looking south on Summit St., is quite typical of the beauty provided by the city's 8,594 trees.**

Not all species and varieties of shade trees are of equal value. Therefore, it is necessary that trees be segregated into groups based on relative value. Somewhat following the recommendation of the National Shade Tree Conference, the trees were placed in five groups as follows: Group 1 valued at 100 percent, Group 2 at 80 percent, Group 3 at 60 percent, Group 4 at 40 percent, and Group 5 at 20 percent. The only deviation from this grouping is in the case of elms. Slippery Elm, Red Elm and Rock Elm would fall into the 60 percent group and American Elm or Gray Elm into the 40 percent group. Rather than evaluating these species separately, all elms except Chinese were placed in a 50 percent group.

To illustrate the method of evaluating the street trees, consider an elm with a trunk DBH of 20 inches and rated as a "Class B" tree. By using the formula (0.7854 times diameter squared) the trunk cross-section area of this tree is found to be 314 square inches. The tree has a basic value of $5.00 x 314 or $1570. This would be the value of the tree

if it were in Group 1 or 100 percent species group and also in "Class A" or 100 percent condition class. But elms have been placed in a 50 percent species group so the value would be 50 percent of $1570 or $785. This is also a "Class B" or 80 percent of a perfect specimen tree so its true value would be 80 percent of $785.00 or $628. For the sake of simplicity, these evaluation figures were expressed to the nearest five dollars.

. Based on these values and on the count of trees made on the survey, Iowa City trees are worth $4,193,-580. Of the 8,594 trees, 4,206 were elm, 995 were hard maple, 721 were ash, 533 were soft maple and 216 were oak. Many varieties were represented by the remaining trees.

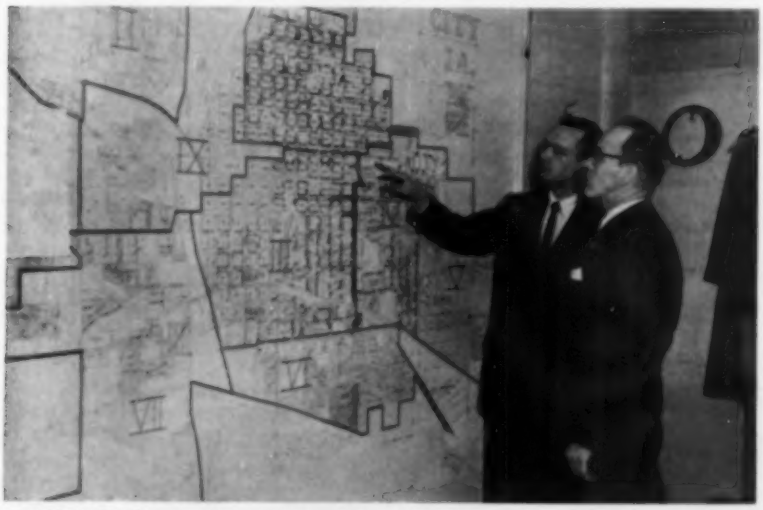
Street Tree Program

The big problem facing Iowa City now is the coming of the Dutch Elm Disease. As shown by the tree survey, 49 percent of the total street tree population are elms. A big step has been taken to prevent the disease from reaching disastrous proportions by the application of a dormant DDT spray. There are, however, additional steps to be undertaken. The Dutch Elm beetle breeds in dead or dying elm wood and this source of contamination must be removed. The removal of dead wood from elms not only reduces the breeding place of the beetle but also helps to increase the vigor of the trees. Vigorous trees are less likely to be infected with the disease. All of the dead elms and any that are in poor condition should be removed. Some of the dead elms have already been removed by enforcing the present ordinance that makes removal of such dead trees the responsibility of the abutting property owner.

With a three-part program of spraying, pruning and removal, the City can be assured of saving about 95 to 98 percent of the elms when the disease arrives. A pruning program should be initiated to make one complete round of the street trees every four years which should include pruning of all desirable species. Pruning procedures should include removal of all dead and dying limbs, removal of weak and cross branches and trimming to allow free passage of pedestrians and vehicular traffic. Such trimming for clearance should be done eight to ten feet above sidewalks, twelve feet above streets and about sixteen feet above principal routes. Drains should also be installed in elms for the treatment of wetwood disease.

Pruning and trimming of street trees should be done by a city crew under the supervision of the city forester. This would assure proper pruning procedure and a much improved end product.

After one complete cycle has been made, trees are pruned and undesirable trees removed, then additional corrective tree surgery such as cabling and cavity work may be initiated.



● **TREE SPOT map shows all street trees in the city by species. City Manager Peter F. Roan in foreground; Raymond R. Bruns, City Forester, pointing at the map.**

Summary and Recommendations

Among other things, the census indicates that: 53 percent of the street trees in Iowa City are elms; 50 percent of the total shade tree population are elms; of the total street tree population 60 percent are in need of pruning. Most of the street trees in Iowa City have been neglected and in many cases are improperly located. Low hanging branches and improperly located trees interfere with traffic flow and utility wires. Dead branches or defective trees constitute a menace to the public safety. Dead branches and defective trees should be removed to alleviate the hazard. Other street trees are crowded, have not developed properly and should be removed to improve the condition of the remaining trees. All future street tree planting should be properly planned and supervised to prohibit improper location.

The street tree problem should be approached from a long-range point of view. One approach to a solution is for the city to assume complete responsibility and do all the work on street trees and pay the total cost.

Using the 1950 census figure of 27,000 population for Iowa City and an estimated annual cost of $38,390 to maintain street trees, it is determined that the annual per capita cost would be $1.42. The population has increased since 1950 so that the actual per capita cost should be even lower.

When it is figured that the annual cost of $38,390 is less than one percent of the total estimated value of the street trees, it is evident that it is a small amount to invest to maintain or increase that value.

Mr. Bruns' recommendations concerning the street tree situation in Iowa City were as follows:

1. The city should assume control of the street trees based on the right of municipalities to control streets for the purposes of travel and safety.
2. An eight-year program for tree maintenance should be considered for adoption.
3. The city should do the tree work with its own crews under the supervision of the city forester.
4. The elm spraying program should continue as long as the threat of Dutch Elm Disease exists.
5. The last week in March should be set aside as "Elm Clean-up Week" for the destruction of all down elm wood with tight bark.
6. New street tree plantings should be made at the request of the property owners, following the Master Shade Tree Plan for proper location and desirable species.
7. Cost of new trees should be paid by abutting property owners and it should be their responsibility to maintain the new trees for two years following planting.

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Rock Salt is harmless: Rock salt does no harm to people's hands, clothing, shoes or rugs. It does not affect in any way materials such as wood, rubber, leather or plastics.

Rock Salt is economical: A truckload of rock salt goes a long way; covers five times more mileage than the same truckload of abrasives—speeds road safety, saving money and time. And rock salt does not have to be spread completely over the entire road surface.

Abrasives are dangerous: Abrasives just lie there . . . actually retard melting by forming a crust over snow and ice. They never remove ice or snow . . . and they leave dangerous ruts.

Abrasives are dirty: When sun finally melts pavements clear, abrasives leave a residue which eventually dries to become clouds of dust and sewer-clogging bulk. Abrasives cause expensive spring cleanup of gutters, catch basins, storm sewers.

Abrasives are damaging: They chip paint and chrome, exposing base metal to corrosion. Tracked into buildings, they injure every kind of floor. Abrasives are hard on yards and spreading equipment, too.

Abrasives don't go far: They must be spread many times in one storm because just ¼ inch of snow will make them ineffective. Abrasives must completely cover a road—missed areas have no protection. Frequent reloading slows ice control operations.

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AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

APWA Sponsors Research Project on Monitoring Incinerator Emissions

Chicago, Ill.—A research study is being initiated at the Armour Research Foundation in Chicago, with the ultimate objective of developing improved methods for the efficient operation of municipal refuse incinerator plants in conformity with the best practice for limiting emissions of smoke and dusts. This project is sponsored by the APWA Research Foundation which offers a practical approach to the problem of financing research work at the state and local levels of government.

The initial phase of work, costing $17,500, involves the development of better and faster methods for monitoring such particulate emissions in order to provide data needed for the eventual reduction of air pollution. At the present time, measuring the concentration and particle size distribution of stack emission is an expensive and time-consuming operation. It is expected that the development of practical monitoring procedures will be greatly facilitated by the use of electronic particle counting equipment which has been developed by the Armour Research Foundation.

The ARF electronic particle counter is a versatile instrument which has been used on air pollution and aerosol studies to give rapid particle counts and size measurements in gas streams. As a sample of dusty gas is pulled through the instrument, the number of particles in each of six size classes is determined and automatically displayed on a set of counters. Particles ranging in size from 0.5 micron to 64 microns can be sized at rates up to 10,000 particles per minute, and the results are immediately available to guide further work.

The instrument operates by measuring the light scattered by each individual particle as it passes through a narrow, well defined beam of light. The optical and electronic systems have been designed so that the light pulses produced are directly related to the particle sizes. A sensitive multiplier phototube converts the light pulses to electrical signals which are then amplified and electronically sorted to proved direct indications of particle count and size distribution. The particle counter is adjustable for operating under a variety of conditions, and has built-in provisions for sampling and calibration.

The cost involved in planning and developing the project and handling the contractual arrangements was financed by some three hundred cities and counties who support the APWA Research Foundation through a special type of public agency membership. The project itself, however, is being financed through funds made available by New York City, Philadelphia and Milwaukee. The City of Hartford, Connecticut and the new England Chapter of the APWA have also provided financial support. Other cities and counties that have expressed an interest in this research work are expected to participate in the financing of subsequent phases of the project.

The work will be conducted under the general direction of a Steering Committee composed of representatives of the contractual parties. Members of the committee include M .A. Fischer, G. Langer and S. Rander of the Armour Research Foundation staff; Casimir Rogus, director of engineering, Department of Sanitation, New York City; Abraham Michaels, chief sanitation engineer, Philadelphia; Bernard J. Geisheker, superintendent, Bureau of Garbage Collection and Disposal, Department of Public Works, Milwaukee; and Theodore Winkler, waste disposal engineer, Department

National Public Works Week

October 2-8 has been proclaimed NATIONAL PUBLIC WORKS WEEK. As part of the Nation-wide observance, ten public works officials will be selected and honored as the "Top Ten Public Works Men-of-the-Year." This Award is being sponsored and administered by the American Public Works Association, a non-profit, public service organization, with the cooperation of Kiwanis International.

OFFICERS: Frederick W. Crane, Buffalo, N. Y., *President;* Albert G. Wyler, New Orleans, La., *Vice President.* REGIONAL DIRECTORS: (term ending 1961) Louis H. Moehr, Wyandotte, Mich.; John A. Morin, Oakland, Calif.; Roy W. Morse, Seattle, Wash.; (term ending 1962) Paul R. Screvane, New York, N. Y.; Manon P. Phillips, Augusta, Ga.; Edward J. Booth, Bismarck, N. D.; (term ending 1963) George J. Maher, Lewiston, Maine; Robert S. Hopson, Richmond, Va.; Harlan H. Hester, Fort Worth, Texas. *Immediate Past President,* Jean L. Vincenz, San Diego, California. Robert D. Bugher, *Executive Director.*

of Public Works, Detroit, who is serving as the Association's representative on the committee. The first meeting of the Steering Committee was held on Friday, August 12, in New York City.

John F. Laboon Receives Sanitation Award at Congress

Chicago, Ill.—John F. Laboon, executive director and chief engineer, Allegheny County Sanitary Authority, Pittsburgh, Pa., was named at the 1960 Public Works Congress and Equipment Show August 14-17 in New York City, as the recipient of the 1960 Charles Walter Nichols Award.

Mr. Laboon was cited for his imaginative and capable leadership in bringing into reality Pittsburgh's $100 million trunk sewer and treatment plant project, serving seventy separate municipalities. While noted for its engineering distinction, size and architectural innovations, it is the first sewage treatment plant in the world to be designed around the process of concentrating undigested sludge for incineration.

The Nichols Award is given each year by the APWA to a municipal public works official who has been responsible for an operation or design which reveals "originality of thought and aggressiveness of execution by the candidate." The ideas developed or designed must have been put to practical use within the governmental unit in which the candidate is employed and he must not have received any commercial return for his achievement.

Formal presentation of the award, which includes a certificate describing the achievement and an honorarium of $500 was made August 17 at the Annual dinner of the American Public Works Association at the close of the 1960 Public Works Congress and Equipment Show held in New York City August 14-17.

Laboon, a graduate of Carnegie Institute of Technology, became executive director and chief engineer of Allegheny County Sanitary Authority in 1955. Prior to this, he served as Chairman of the Board of the Allegheny County Sanitary Authority and chief engineer in charge of preliminary investigations, surveys and planning of systems of collection and treatment of sewage for 100 municipalities. From 1943 to 1945 he held the rank of Lt. Colonel and Colonel, U. S. Army, in charge of public works and utilities behind Army lines in Sicily, Italy and Sardinia; and he also served in a similar capacity in the Province of Linz, Austria, with the Army of Occupation.

C. E. Painter To Represent APWA On ASA Pump Committee

Chicago, Ill.—Jean L. Vincenz, president of the American Public Works Association, has designated C. E. Painter, vice-president and Consulting Engineer, Waterworks Equipment Compay of Salt Lake City, Utah, as the APWA representative on the American Standard Association Committee B-58 on vertical turbine pumps.

The original B-58 Committee was organized in 1949 for the purpose of developing a standard for deep well vertical turbine pumps. After many meetings and a great deal of correspondence, the B-58 Line Shaft Vertical Turbine Pump Section was completed, the approval of the committee as a whole was obtained, and a standard submitted to the Association in 1955. In the spring of 1955, this document was approved by the American Water Works Association and the American Standards Association.

Following this, the B-58 Committee was given the assignment of coming up with a standard for sub-

THERMAL SNOW MELTER CLEARS RAMP AREA AT LA GUARDIA

Photo courtesy of The Port of New York Authority

Shown is a 25 ton per hour installation at La Guardia Marine Terminal being fed by bulldozer.

NO SHUTDOWN DURING 14" SNOW FALL

La Guardia Marine Terminal kept 110,000 square feet of ramp area clear and usable during the great snow of March 3rd and 4th of this year. The system melted 25 tons, or 185 cubic yards of snow per hour. Actually snow was disposed of as rapidly as it could be bulldozed into the melting pit.

The Thermal Snow Melting System was designed specifically for use on airport ramp areas and is the fastest, most inexpensive method of disposing of snow. La Guardia was able to operate the system at a fuel cost of $7.50 per hour, based on a 15¢ per gallon price. The melter may be fired with either oil, gas, or JP fuel.

The Thermal Snow Melting System was originally developed by Esso Research and Engineering Corp. around the unique flame characteristics of the Thermal High Velocity burner. Because of the simplicity of installation, multiple melting pits can be installed and there are no practical limits of the size of the area that can be serviced.

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PACKER BODIES Cost 1/3 Less Than Rear Loading Units of the Same Rated Capacity, Yet Hold Yards More of Compacted Refuse!

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Because of M-B's square, van-type body design which eliminates dead weight, the compactor body can be mounted on a low-cost, popular size truck chassis with resultant savings in lower operating and maintenance costs.

There's a size for every need: 14 to 24 cu. yd. truck mounted; 32 and 38 cu. yd. in both the Trail-Pack, self-powered trailer type models and the M-B Contain-O-Pack Self-Loading Packer system for "containerized" refuse handling.
From every angle, you're dollars ahead with M-B Packer Bodies — the choice of hundreds of private haulers and municipalities.

Money-Making Features

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- **COMPLETE SAFETY** - because of side loading from the curb, eliminating danger to collectors from passing traffic. All compaction mechanism located inside the body — safely out of operator's reach.
- **PACKS ANYTHING** — barrels, crates, cartons, etc. without pre-crushing. Use as general purpose truck for hauling snow, ashes, park equipment, nursery stock, leaves, etc.
- **CONTROLLED DUMPING:** full load is pushed out quickly and safely by packer plate *without raising the body* as in hydraulic-type units.
- **LESS DEPRECIATION** — low truck cost, low body cost and less wear and tear adds up to less depreciation of your original investment.
- **MORE BLOCK COVERAGE** — progressive compaction, easy loading means more tonnage per load — fewer trips to the dump or incinerator.

The proof is in a demonstration. See your distributor or write the M-B Corporation, New Holstein, Wisconsin.

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with Dow Calcium Chloride

PELADOW®
(94-97% conc.)

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Dow calcium chloride works remarkably fast on ice at *all* temperatures even down to —59°F. May be applied alone or used with rock salt, sand or other abrasives. Prevents freezing in stored abrasives, too. Two forms, pellet or flake . . . more economical in bulk.

Write for "Winter Maintenance Program" kit.

DOW

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

mersible motor-driven pumps and a field test code

The Committee has held a number of meetings in connection with the drafting of this standard which is in demand by the water works turbine pump users of this country. It is expected that the new standard will be ready for approval by the AWWA and the ASA within the next few months at which time other similar assignments will be given to this particular committee.

Mr. Painter is past president of the Utah Chapter of the APWA and is currently serving the Association as that State's District Representative.

Clarence A. Keeping Honored for Special Service to the APWA

Chicago, Ill.—Clarence A. Keeping, engineer of special projects, Winnipeg, Manitoba, Canada, received the American Public Works Association's Harry S. Swearingen Award at the Association's recent

The Utility Official's Place in APWA

All of us who use the street right of way utilize the same space in bringing essential services to the public. Of necessity, the public has a big stake in requiring all of us to work together in the street right-of-ways; the price tag for all these services would be too great if the streets were not fully utilized.

The public works field is enormous in extent, in the varied skills required and in its share of tax money. I am sure that nowhere does the public get more for its tax dollar than from public works people. But the very extent of public construction and the intense use of street right-of-ways bring serious problems.

To clear the path for freeways, streets, flood control, airports, buildings and other public works activities, requires relocation of numerous utility lines annually. The same people who design and construct these Public Works projects also write the street-use ordinances, issue permits to occupy the street, and say when and how the street is to be used.

Cleo Craig, former president of the Bell System, about nine years ago urged us to work together. Just as good businessmen measure the total market, then measure their share in that market, all of us in public works, and utilities included, must study the whole economy, and determine how we are going to work cooperatively to provide the public with what it needs in the way of streets, highways, sewers, flood control, utilities and other public works.

Planning is no longer a one-man, one-company, one-city affair. In this era of metropolitan growth, what affects one city affects all cities. Planning which will bring the public all the services it needs cannot be fragmentary. The job is big enough to call for an interchange in techniques and methods.

Mere acquaintance between public works and utility people is not enough. This is a grass roots deal, starting at the working level and going all the way to the top. Joint planning must start from the inception of design at the drafting table and continue to the completed job.

What is the utility official's place in APWA? From the foregoing, you may see that I think that through the APWA one man can get to know public works officials personally, as well as their problems; thus, utility people can actively coordinate and plan those things that concern civic officials, such as interagency planning, keep traffic flowing, provide a free road to construction and thus make all of our work "easy does it."

Frank Randall

Frank Randall is the APWA District Representative in Southern California and is a member of several committees of the Association. He helped organize the Southern California Chapter and served as its president in 1958. Mr. Randall is Right-of-Way Superintendent for the Pacific Telephone and Telegraph Company in Los Angeles.

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for straight and offset concrete sewer pipe

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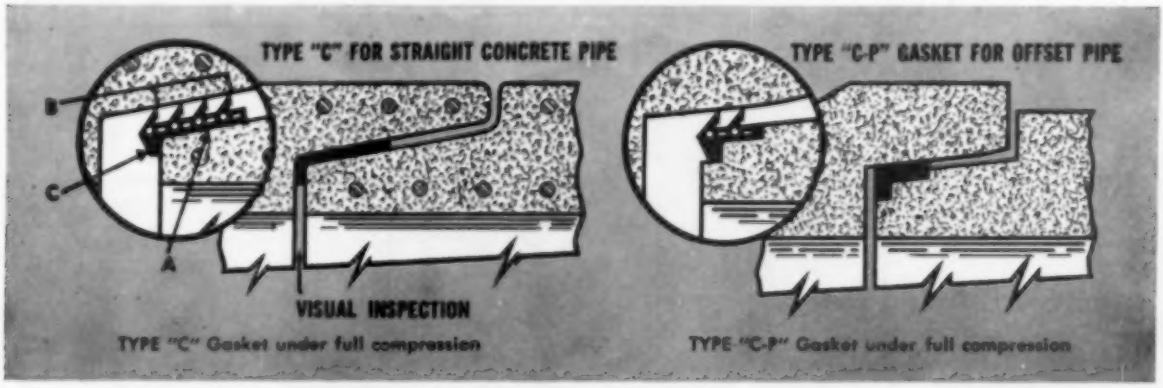
"C" SERIES
flexible GASKETS

Sanitary Engineers can take advantage of the matchless efficiency of TYLOX Flexible Gaskets for coupling *any* concrete pipe sewer they design . . . because there's a specially designed TYLOX cross-section for *any type* of concrete pipe!

Type "C" Gaskets for straight, and type "C-P" Gaskets for offset pipe, provide the same high performance features you are accustomed to in famous Type "A" Gaskets . . . PLUS a visual inspection feature made possible by a flange which overhangs the edge of the pipe tongue, or tongue offset, according to the type of pipe. On pipe large enough to admit workmen, proof of correct gasket positioning can be obtained by noting whether the inspection flange is evenly seated around the entire circumference of the joint. The larger the pipe, the more important this visual inspection feature becomes.

TYLOX "C" Series Gaskets are made for all pipe sizes, handle head pressures up to 50-feet, and are available in either rubber or neoprene. They may be applied to pipe at the pipe manufacturer's plant, or at the job site. Like all TYLOX Gaskets, they are immune to sewerage and industrial waste acids, and keep joints *water-tight* for the life of the pipe itself.



"C" Series TYLOX Gaskets consist of base A; sealing fins B; and inspection flange C. In addition to providing the inspection feature, the "locking" effect of the flange holds Gasket in true position as pipe is coupled. Design of the sealing fins is such that horizontal end-thrust forces causing "kickback" in some couplings, are eliminated in Tylox "C" Series Gaskets, assuring full seating and true alignment of pipe.

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★ **Power Boom Control** permits fast raising and lowering of boom for rapid trenching; depths are accurately controlled, eliminating guesswork.

★ **Reversible Dirt Conveyor** is standard equipment — deposits dirt at selected distance from either side of trench. In only 60 seconds, conveyor may be switched from one side to the other.

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★ **Smaller Model JR** Trench-Devil digs 2¼″ or 3½″ wide, up to 20″ deep. Simple, one-man operation and fast — speeds of 15 feet per minute at a 12″ depth.

Write today for full details on both models. Dept. PW.

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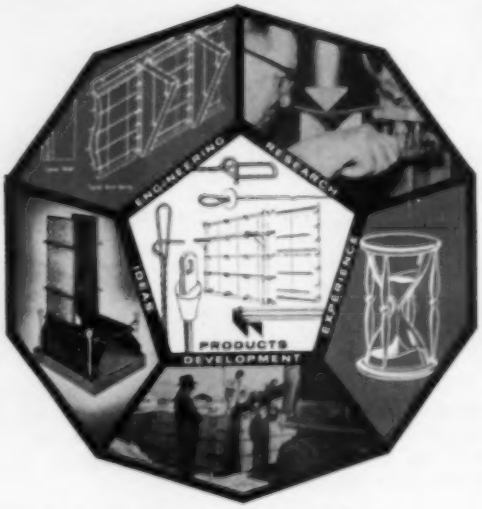

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Congress in New York. The selection of Mr. Keeping for this honor was announced at a banquet held at the Hotel Astor.

Keeping, one of the founders of the Association's Manitoba Chapter, was honored for his outstanding service toward the development and growth of that Chapter and for his accomplishments in the field of municipal engineering. The award consists of a bronze medal, with the recipient's name engraved on it, set in a marble base for desk display. Born in England, Keeping is a graduate of the University of Manitoba. He was elected as the Chapter's first secretary-treasurer and held this position until 1959 when ill health forced him to resign. He has been associated with the City of Winnipeg for forty years, and as a full time employee since 1930.

The Harry S. Swearingen Award was established to perpetuate the memory of Harry Sellers Swearingen (1900–1956), principal real estate agent for the Los Angeles Department of Public Works, who worked untiringly in behalf of the American Public Works Association.

NEWS OF ENGINEERS

O. C. HOPKINS, Sanitary Engineer Director of the Public Health Service, has been made Deputy Chief of the Division of Water Supply and Pollution Control. He succeeds ARVE H. DAHL, who will have a year of duty and training at the Industrial College of the Armed Forces.

B. W. DAVIS, long time outstanding Maintenance Engineer of the North Carolina State Highway Commission has retired. He will be succeeded by LAYTON GUNTER, formerly Assistant Maintenance Engineer. JOE J. POWELL becomes state bridge maintenance engineer succeeding C. B. TAYLOR.

ROBERT H. HARRISON has retired after long service with the Bureau of Public Roads. He had been Engineer for Region 4, embracing Illinois, Indiana, Kentucky, Michigan and Wisconsin.

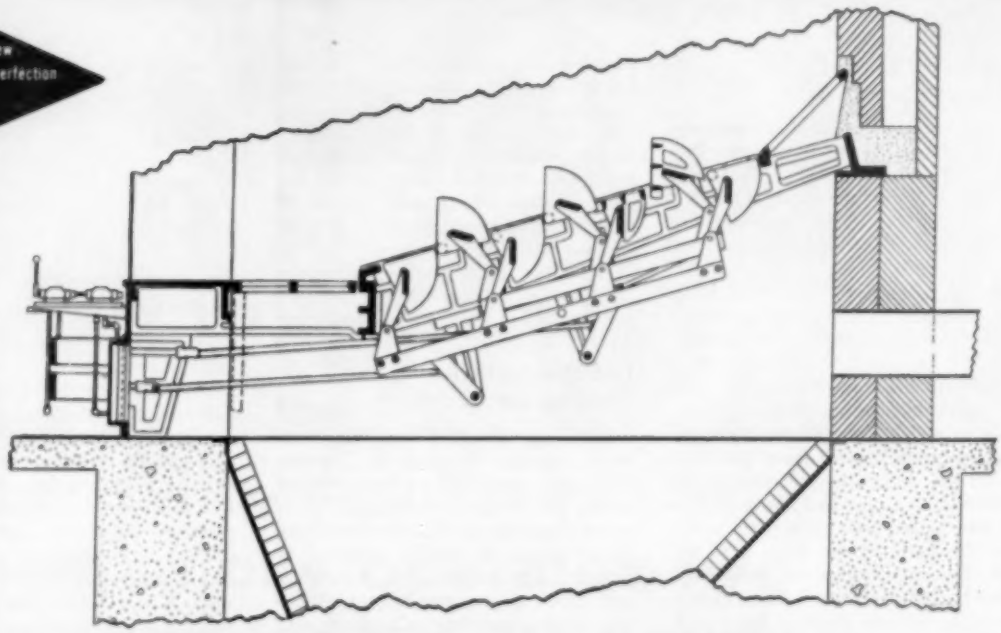
LLOYD K. CLARK of the firm of Clark and Groff, consulting engineers of Salem, Ore., has been promoted to the grade of Colonel in the Army Reserve. He was called to active duty in 1941 and served throughout the war, in Washington in the office of the SGO, and in the Southwest Pacific and the Philippines with an engineer brigade.

Eastchester, N. Y. chooses

NICHOLS PERFECTION

Rocker Type Stoker Grates

Sectional view of Nichols Perfection rocker type stoker



REMOVABLE GRATE TEETH

WIDER DUMP SECTION

REDUCED LABOR

AUTO-STOKING

The Town of Eastchester, N. Y., has just contracted for a refuse incinerator plant incorporating two 100 ton furnaces equipped with the new Nichols Perfection hydraulically actuated rocker type stoker grates. Consulting Engineer is William Raisch, Garden City, N. Y.

NICHOLS PERFECTION grate systems are designed and constructed by specialists in municipal refuse incineration, drawing on the experience gained in more than 85 installations, with a total daily capacity of over 22,000 tons.

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THE
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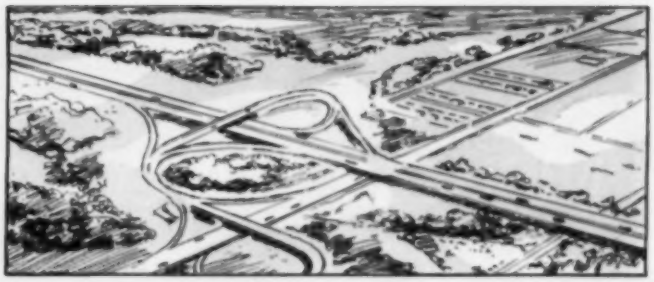
DIGEST



Prepared by **L. G. BYRD,** *Associate Editor*

Geodimeter Speeds Relocation Survey

Precise horizontal control was required for the location surveys for the Antelope Valley Freeway through Los Angeles County, California. The route was outside the district survey Control System, but the use of the Model 3 Geodimeter provided the district survey staff with a survey method that was fast, accurate and economical. The Sacramento Headquarters Geodimeter Crew established an horizontal control network terminating on a previously established base line. The original survey of the base line involved the occupation of stations up to 9000-ft. elevation and many grueling climbs for the eight-man party over the period from Sept. 2 to 15, 1954. The geodimeter measurement of the base line required three nights due to inclement weather but could have been accomplished in one night of good weather. Because intervisibility was not possible between two substations, the measurement was accomplished by measuring two segments, both from a station set on line at an elevation so that the line could be seen in its entirety. The geodimeter measurement gave a closure of 1/78,000, which precision was suitable for all district uses.

"Sierra Highway." By Ira H. Alexander, Chief of Geodetic Section and A. K. Goldin, Chief of Survey, Los Angeles County, California. *California Highways and Public Works*, May-June, 1960.

Snow and Ice Control Programs Surveyed

A survey of typical city officials' comments on snow and ice control revealed that: Costs continue to go up; traffic and parking control are the chief problems during a storm; and the total problem of maintaining winter traffic is growing so acute that a highly organized and controlled program is needed. While no common base is available for accurate comparisons of the divergent factors affecting costs, a tabulation is given showing annual snow and ice control costs and annual inches of snowfall in a number of cities over the past ten years.

"Another Bad Winter Brought Higher Costs and Traffic Woes." *Street Engineering*, July, 1960.

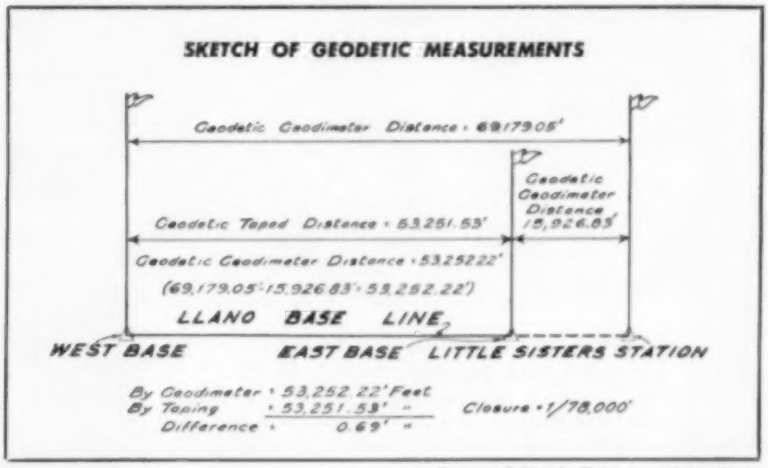
Hot-Mix Asphaltic Patching Procedures

Patching of pot-holes and pavement surface failures in Lincoln, Nebraska is carried on year-around under a carefully developed program. Procedures include: Outlining repair areas in chalk; removal of unsound pavement and trimming perimeter to square edges; cleaning and removing all dust and loose material; painting base and edges of area with hot asphalt; placing and compacting hot plant-mix; and painting and ironing the edges of the completed patch. Lincoln owns and operates its own hot mix plant producing patching material at approximately $8.50 per ton.

"Holes Patched to Last." By Lyle Gieseker, Superintendent Street Maintenance Department, Lincoln, Nebraska. *The American City*, July, 1960.

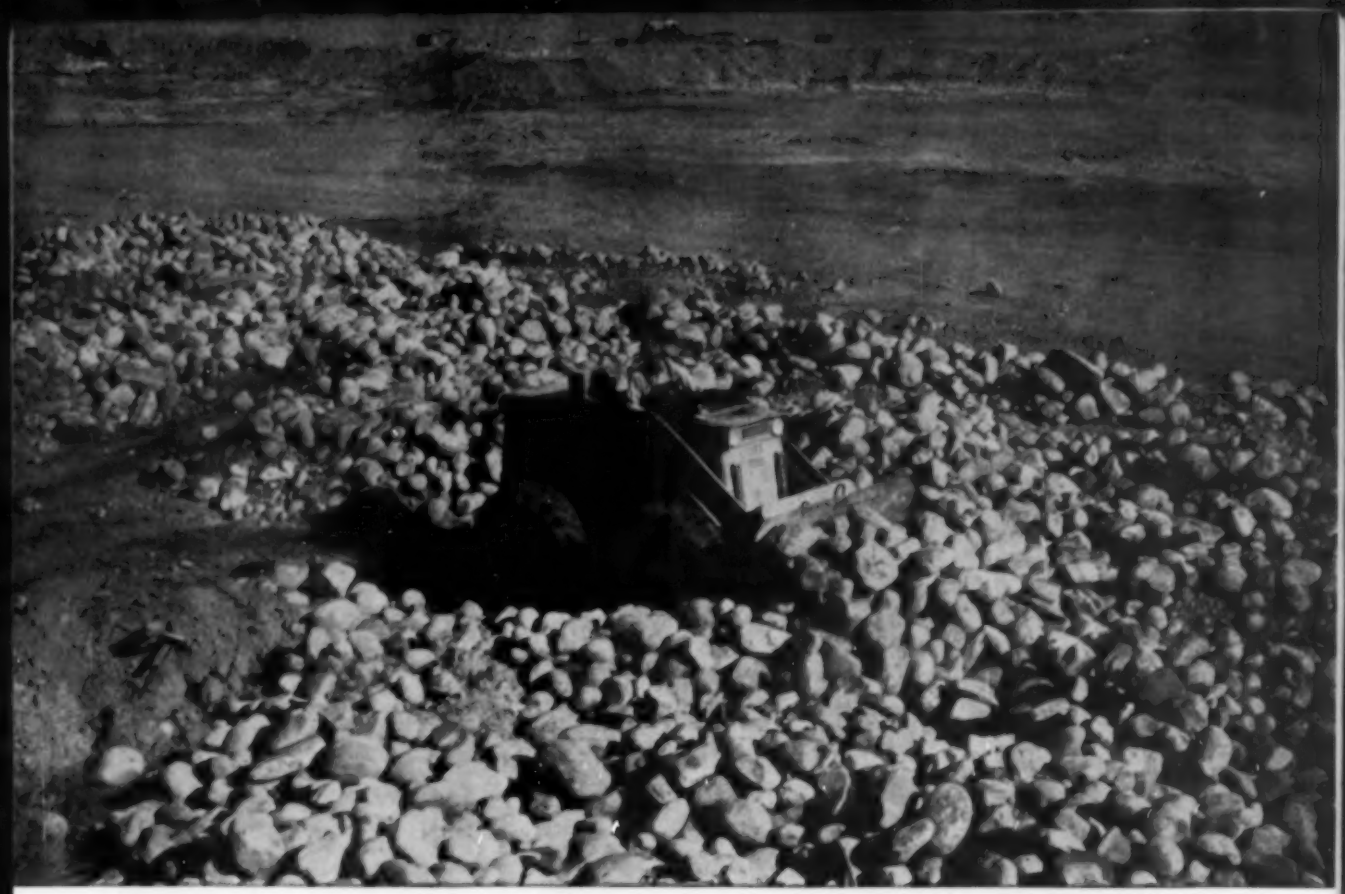
Pavement Maintenance on the Ohio Turnpike

Preventive maintenance on the Turnpike pavement is based on a three-part program: 1) Protection or restoration of slab support; 2) joint, crack and edge sealing; and 3) slab and surface repairs and protection. Structure approaches, trench backfills and heavy embankments often generate differential settlements requiring correction of slab support and sometimes pavement leveling as well. A significant program of mud-jacking is followed to correct surface irregularities of tilted or settled slabs, to fill voids under slabs and to eliminate pumping and flexing at joints. Holes, 2½-in. diameter, are drilled through the slab in a pattern



Courtesy California Highways & Public Works

● GEODIMETER measurement of taped base line showed closure of 1 in 78,000. Due to bad weather, three nights were required, instead of the normal one night.



Cuts costs on rock-loading and other scattered jobs

Canadian city operates two Michigans for $3.70 hourly

By loading rock and other tough materials fast, two Model 75A Michigan Tractor Shovels have substantially cut earthmoving costs in Calgary, Alberta.

The City's two 80 hp 1¼ yd Michigans work for about half as much as the fleet of industrial tractors, belt loader, and 90 hp crawler-loaders they replaced. They waste less time between jobs, too.

Take the pictured task as an example.

On one of its typical "tough jobs," Michigan picks up boulders (big picture), loads them into trucks (above) for haul to river dike.

Michigan speeds to job

Here, a fleet of trucks was waiting to start hauling rock for river dike construction. Obviously, this was a loading job much too tough for industrial tractors. Also, the pit was too far away for a crawler to be trucked in soon. So, the call went out for one of the Michigans.

The closest one drove in rapidly from a gravel pit. Its four-wheel-drive and 8,000 lb lift capacity paid off immediately. Two minutes, four passes, heaped each 5-yard (3 ton) truck. At this rate, the boulder-handling job was soon over . . . and the Michigan in minutes was driven back to its original assignment. Waste time was minimized . . . costs per hour decreased . . . the City's $8,500,000 public works budget (for 215,000 people) stretched.

7,375 working hours: 98.9% availability

Two and a half years operation of this type—heavy jobs, light jobs, freezing cold, dust, rain, road-building, snow-plowing, dirt-salt-gravel loading, etc, etc—7,375 Michigan working hours in all—have cost the City of Calgary only $13,619—an average per hour of $1.85 (including fuel, lubrication, tires, repairs, and depreciation).

Remember, this cost averages all sorts of jobs, *including* rock-loading! (Operators wages are not included; the City charges this cost to the department as a whole, not to a specific machine.)

Even if you *do* include wages against the Michigans, we're sure you'll agree they are being operated very reasonably. Could Michigan's speed, mobility, and ruggedness help you? We'll be glad to demonstrate so you can judge for yourself. See your Michigan Distributor to arrange a date. His name, address and phone number are listed in your regional construction magazine.

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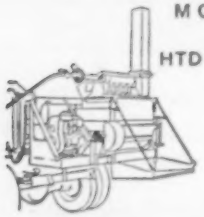

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National distributors: Asphalt Equipment Co.
3314 Cherry Lane, Fort Wayne, Indiana

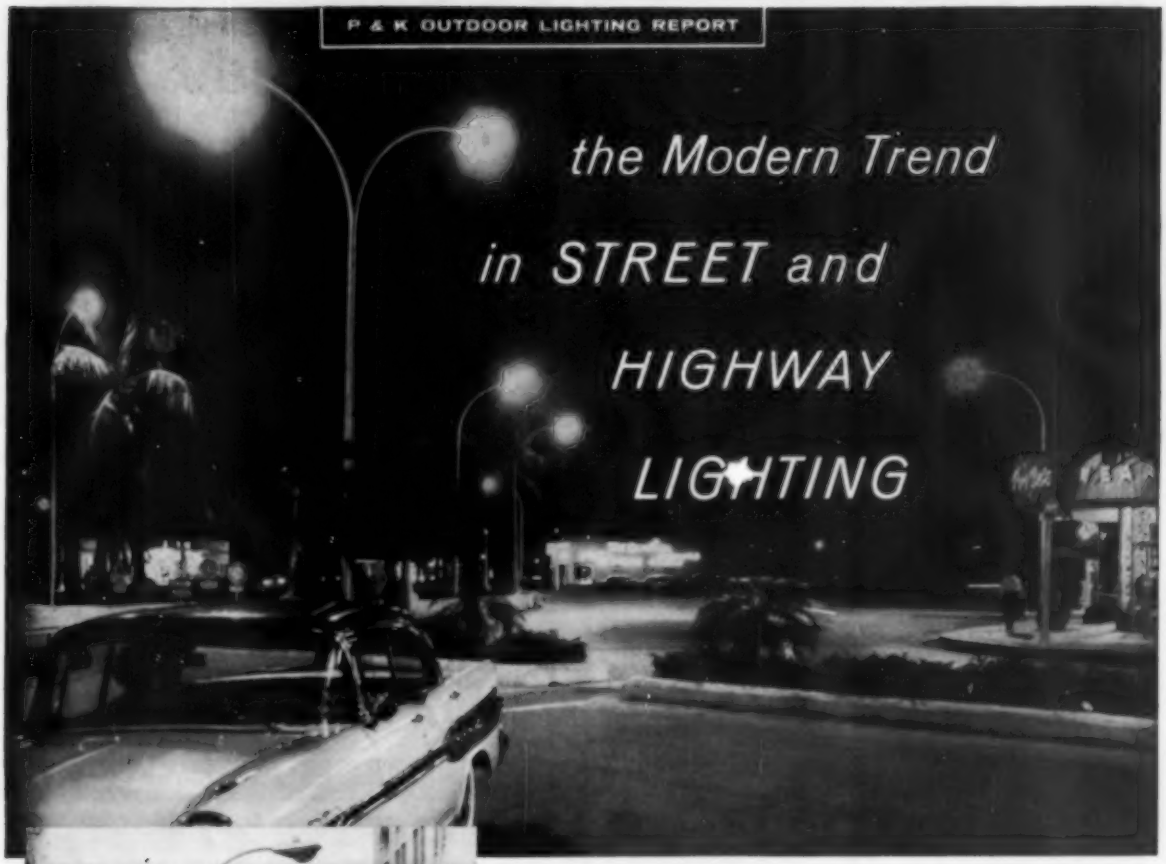
with 6-ft. longitudinal and 4-ft. transverse spacings and clearances of 12 in. from joints and 18 in. from edges. A slurry of 2 parts Portland cement, 4 parts fine limestone dust (80 percent passing 200 mesh) and 6 parts coarse limestone dust (75 percent passing 100 mesh) is mixed with water to a heavy cream consistency and pumped under the slab with a Koehring No. 10 Mudjack. Mudjacking is carried on alternately in one lane and then the other, allowing traffic to continue over the free lane where it helps to level the slab and distribute the slurry in a uniform lens on the underface. Curing is allowed to take place under traffic. Edge-blowing and moisture bleeding from joints is corrected by careful sealing of joints, cracks and edge joints between the concrete pavement and penetration macadam shoulders; and by installation of french drains and perforated pipe outletting free water in the subbase material to the slope surface. Cold-applied, rubberized, asphaltic sealant is used to reseal joints and cracks. Asphalt emulsion and stone chips are employed for edge sealing work. Pavement repairs are generally accomplished with Portland cement concrete patches though some experimental work has been done with epoxy resins.

"Pavement Maintenance on the Ohio Turnpike." PUBLIC WORKS, August, 1960.

De-Slicking Asphalt Surfaces

A study of bituminous surfaces in Indiana indicated two basic causes for slick surfaces: 1) Asphalt flushing to the surface and 2) polishing of exposed aggregate. A practical solution to the presence of fat or polished surfaces has been found through the use of a heater followed by blading. An additional benefit is gained by this operation in the removal of the usually-present ruts and other surface irregularities. Indiana's heater, built by maintenance personnel, is 18-ft. long, 63-in. wide and operates effectively in warm weather traveling at 20 ft. per minute. The next unit to be built calls for a 90-in. width and a capacity to travel at 50 ft. per minute better to "pace" the cutting operation. A heavy duty motor grader is employed for cutting, following as closely behind the heater as possible. Another grader or broom brings up the rear of the procession to clean the pavement since the operation is carried on under traffic. Costs of cutting operations have ranged from

P & K OUTDOOR LIGHTING REPORT



TOP PHOTO: Traffic circle illumination — West Miami Springs, Florida

LOWER PHOTO: New White Way — White Plains, New York

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More than just modern-looking, P&K street lighting standards are modern in total concept. Compare our use of functional design . . . no scrolls, no tie rods . . . instead a strong aluminum tapered elliptical arm — one piece for minimum inventory, fastest assembly and installation. Compare the P&K davit, truly the ultimate in functional design with a style as fresh as tomorrow. What's more, P&K is modern in the materials of construction: to the inherent strength and light weight of aluminum, P&K has engineered designs to meet every load requirement—from the conventional incandescent and mercury vapor luminaires to the new, larger and heavier models in both mercury vapor and fluorescent. And above all, P&K is modern in its elimination of maintenance problems. No painting required — ever. Even the salty sea air offers no hazard to the good looks of P&K standards.

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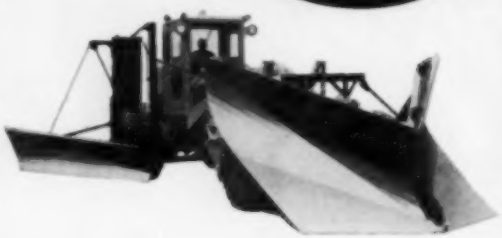

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For full details on making year-around cost-saving use of your graders with extra-duty FRINK Sno-Plows, write: Dept. PW-96

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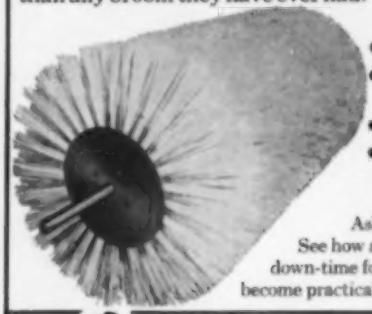

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17 down to 10 cents per square yard. Substantial reductions in costs are expected when the higher capacity heater is used. Where surface slickness is caused by exposed, polished aggregate on an otherwise sound pavement, correction has been accomplished by applying a thin abrasive resurfacing. In cooperation with the Purdue Joint Highway Research, various sand-asphalt formulations were developed and applied to selected locations on the state highway system. Wearing qualities and surface traction have been generally satisfactory and detailed specifications have been developed and adopted by the state highway department for thin sand-asphalt surface courses.

"De-Slicking Asphalt Surfaces." Merl J. Ford, Field Engineer of Maintenance, State Highway Department of Indiana. PUBLIC WORKS, August, 1960.

Detroit Upgrades Bituminous Mixes

To develop bituminous concrete material specifications and mix designs with improved workability, shove resistance and stability, Detroit established a Consolidated Testing and Research Laboratory. Local slag aggregate was investigated for use as the source of both fine and coarse aggregate for bituminous concrete and an all-slag mix was designed. Subsequent pavement construction using this design was evaluated. While workability was somewhat less than local crews were used to, the pavements were uniform in appearance and showed high stability value. Because of the lighter weight of the slag, greater coverage per ton of concrete was obtained. To maintain a competitive position for the stone mixes, stone and sand mix designs were studied with a resultant incorporation of a locally available pit sand into mix specifications producing a bituminous concrete with good workability and high stability. The development of new aggregate sources and design mixes has generally improved bituminous concrete standards throughout the Detroit area.

"Detroit Upgrades Bituminous Mixes." Maurice Greenberg, Engineer of Tests, Detroit, Michigan. *Roads and Streets*, July, 1960.

Report on Federal Highway Program

The new expanded highway program is now four years old, the Fed-

FOX spreader feature No. 3

Fox *exclusive* Dash-Mounted Electric Control Panel. Includes—ignition and starter switches for spreader engine . . . volume regulation control . . . switch for electric clutch controls accurate spreading of sand, salt, cinders, chips and calcium chloride.

Spreader control inside cab lets one man do work of 2 or 3

Put yourself in the middle of winter. Roads and streets are icy, dangerous! The job, to get them sanded in the quickest possible time. Which materials spreader will do best for you? Some require two, even three men . . . take more than one pass to cover a street . . . others work slow, hold up traffic. At any rate, chances are there will be breakdowns . . . cheap units are light-duty . . . chain and apron feed units just naturally give trouble.

The solution—Fox Mountable Materials Spreader! Big, heavy-duty, auger feed, powered by its own 18 H. P. engine. Installs on any standard dump body in only 15 minutes (take it off just as fast). *All* controls are mounted right on the truck dash . . . at fingertip reach to the operator. *Yes, only one man does the job.*

On the Fox, he simply flicks the spreader ignition switch, pushes the starter button and sets the spreading rate. Then, on the street, he snaps the electric clutch switch to lay a smooth even spread of material in widths from 8 to 40 feet . . . any desired thickness, and at truck speeds from 5 to 40 miles per hour. Spreads *under* parked and passing cars, too . . . ahead of rear truck wheels for added traction.

To see all the Fox Features
ASK FOR A DEMONSTRATION

The Fox Materials Spreader will cut your labor, time and equipment expenses to the bone. A catalog . . . case history reports . . . even a no-obligation demonstration are yours for the asking. *Write, call or wire collect for the name of the nearest Fox distributor, who will gladly give you a demonstration.*

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eral Aid Highway Act of 1956 having become law on July 1, 1956. The Act was a legislative milestone in that it called for a long range program, set a time schedule for its completion and provided for forward-looking standards to meet traffic needs of 1975. The Act provided the impetus for expansion of the organizations administering the program and the parallel expansion of the highway industry. Improved efficiency in road building operations have been reflected in the stability of unit costs for highway construction in the face of inflationary pressures in our general economy. The AASHO Road Test, in which research project the Federal and state governments are working in close cooperation, is a conspicuous example of highway research activity during the past four years. While the first years of the program involved a heavy concentration of effort and money on planning, design and right of way acquisition, an impressive portion of the Interstate System is already open to traffic—8,855 miles of the 41,000-mile system by March 31, 1960. Only about half of the Interstate mileage open to traffic was constructed with the 90-10 funds of the 1956 Act; the remainder consisted of the results of programs begun prior to 1956 and included toll road and other program mileage. Completed mileage does not accurately measure the true rate of progress—4,353 miles under construction, preliminary engineering or right of way acquisition on another 10,436 miles and altogether 23,644 miles on which some work has been done. This work has been accomplished without harm to the continuing program on the ABC system. Financial uncertainties have hampered the Interstate Program almost from the beginning. The "pay as you go" Senate amendment to the original bill, the carrying of nearly $2 billion of previous authorization against the new Trust Fund; and the acceleration of the ABC Program in 1958 advanced the inevitable date when the program would run out of money. Two important documents will be submitted to the Congress in January, 1961: 1) A revised estimate of cost of completing the Interstate System and 2) a report on a comprehensive four-year study by the Bureau of Public Roads providing basic highway cost allocation information on the use of the Federal aid highways, the cost of services provided by the highways to various classes of users, and the value of the services to users and non users. It is hoped that the Congress will respond to the public demand for better roads with legislation in 1961 to assure the successful completion of the Interstate Program on schedule.

"The Highway Program—4 Years Later." By George H. Fallon (D-Md.), Chairman, House Subcommittee on Roads, United States Congress. *American Road Builder*, July, 1960.

Other Articles

"Private Engineering and The Highway Program." Recent developments in the definition of the appropriate **use of consultants** in the Federal aid highway program. By George S. Richardson, President, Engineering Division, ARBA. American Road Builder, July, 1960.

"The Problem of The **Amber Signal Light** In Traffic Flow." A theoretical analysis and observations of the behavior of motorists confronted by an amber signal light. By Denos Gazis, Robert Herman and Alexei Maradudin, Research Laboratories, General Motors Corporation, Warren, Michigan. Traffic Engineering, July, 1960.

"Pedestrian Tunnel Overcomes Traffic Bottleneck." Underpass for pedestrians constructed by tunneling and use of galvanized Armco liner plates permits

the "Big Scottie"

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TARCO'S *double auger*, body-type all purpose Spreader for Ice Control

The "Big Scottie" gives you these unique advantages: (1) the **double-auger spreading system** lets you apply more material per minute (salts, sand, cinders, or mixtures). (2) full-covering, heavy **top screen** is made in **4 hinged sections** so 1 man can handle, (3) the special **body design prevents** your **material from bridging** over the augers.

You'll be able to cover **more miles** of winter-time icy pavement **much faster.** The "Big Scottie" is an ideal spreader for spreading straight de-icing salts . . . you can apply as little as ¾ of an ounce per square yard at 15 M.P.H.

The "Big Scottie" slips in or out of a dump truck body in 15 minutes; or mounts on a truck chassis in less than 30 minutes. Besides the exclusive features of the double-auger spreading system and the nonbridging body design **(no agitator needed);** the "Big Scottie" has all the regular features a good spreader should have: all welded steel construction; extra heavy, well protected roller chain drive **(with special lubrication system)** more than ample drive power **(30 H.P.);** large, sealed bearings; simple quick-acting width control; an easily read material application rate table for various materials at various truck speeds; stainless steel spreading disc.

See your nearest Tarco dealer or write us for more complete "Big Scottie" details.

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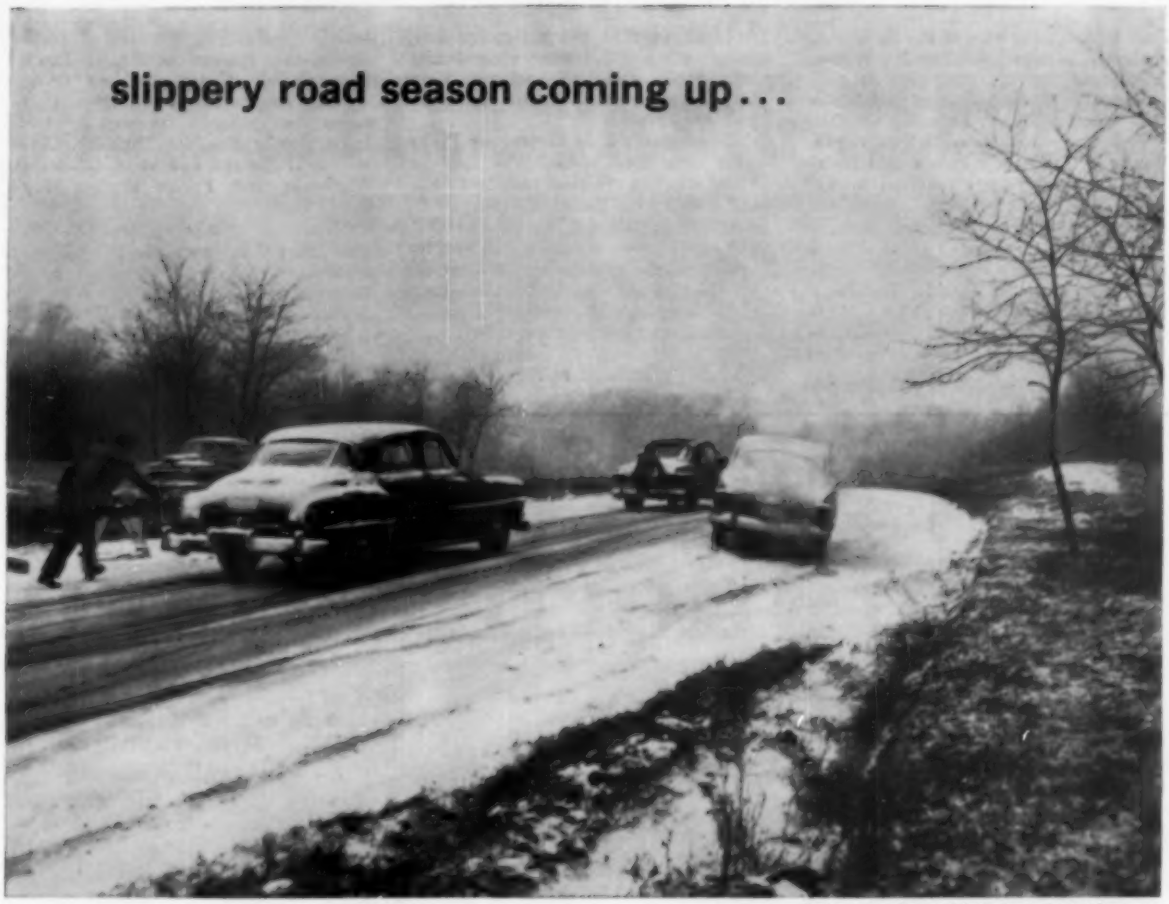

Photo courtesy Bureau of Public Roads, Dept. of Commerce

Icy roads like the one above are quickly changed to safe, bare pavements with Columbia Calcium Chloride–rock salt mixtures.

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BARE PAVEMENT FASTER: Test results (right) prove the ice melting action of Columbia Calcium Chloride–rock salt mixtures. And, mixtures give you a uniformly clear pavement, free from treacherous patches of ice.

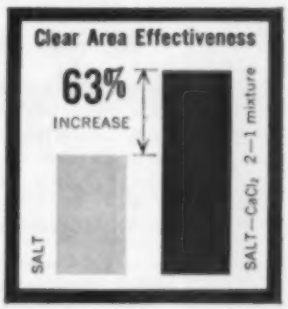
ALL-TEMPERATURE EFFECTIVENESS: Columbia Calcium Chloride–rock salt mixtures assure quick melt at *all* temperatures—from freezing to sub-zero.

SAVE TIME, MONEY: Columbia Calcium Chloride and rock salt mix easily, can be stored indefinitely, ready for instant use with minimum shelter required. Bulk purchase and storage help stretch maintenance budgets.

Make your winter road plans now in time to get your Columbia Calcium Chloride and rock salt order delivered, mixed and located before winter's first snow fall arrives.

For more information write to our District Sales Office nearest you or to our Pittsburgh Address.

Clear pavement area two hours after application of calcium chloride–rock salt mixtures is 63% greater than salt alone in 25-30° temperature range. (Based on field studies in Michigan sponsored by the Calcium Chloride Institute)



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widening of restricted roadway. By Josh Halbert, Director of Public Works, Jackson, Mississippi. PUBLIC WORKS, August, 1960.

"Progress Promotes **Street and Highway Program.**" A report on the five year program underway in Fort Worth, Texas to bring their streets and highways up to standards required by the phenomenal growth of the metropolitan area. PUBLIC WORKS, August, 1960.

"More Cars and Light—Fewer Deaths" Modernization of Nashville, Tennessee **street lighting.** By Ben West, Mayor of Nashville and E. Parks, Manager, Lighting and Heating Dept., Nashville Electric Service. The American City, July, 1960.

"How We **Control Our Subdivisions.**" The features of a comprehensive city ordinance on subdivision control are outlined. By G. E. Varenhorst, City Manager, Salem, Illinois. The American City, July, 1960.

"Washington's Five Emergency Plans —and How they Work." The nation's capital city has achieved excellent control over traffic and parking to aid in **snow removal.** By William Xanten, Department of Sanitation, District of Columbia. Street Engineering, July, 1960.

"**Driver Tension** Responses Generated on Urban Streets." A study of driver tension responses to events in traffic which cause an overt change in speed or lateral placement of the driven vehicle. Reported by R. M. Michaels, Research Psychologist, Division of Traffic Operations, Bureau of Public Roads. Public Roads, August, 1960.

"**Slipform Paving**—L. A." New technique used on harbor freeway. By R. M. Innis, Senior Resident Engineer, Division of Highways, California. California Highways and Public Works, May-June, 1960.

"**Research in Asphalt** Quality Control." Part V deals with factors affecting serviceability of a bituminous pavement. By Dr. R. M. Traxler, Research Engineer, Texas Transportation Institute, Texas Highways, July, 1960.

"The Use of **Epoxy Resins** in Concrete Construction and Maintenance." By J. F. Farlow, Jr., Design Engineer, Texas Highway Department. Texas Highways, July, 1960.

"Problems in **Zoning Administration.**" By Allen Fonoroff, Chief City Planner, Cleveland City Planning Commission. Ohio Cities and Villages, July, 1960.

"Considerations in the Development of **Limited Access Highways.**" By Lester Hoel, The City College of New York. Traffic Quarterly, July, 1960.

• • •

A British Composting Plant Serves 25,000

A composting plant has been constructed at Renton, by Dunbarton County Council, to handle 25 to 27 tons of crude refuse per day from a population of about 25,000. The plant, which uses the Dano system, is located near a sewage pumping station and will be capable of utilizing 5 tons of 92.4 percent moisture sewage detritus per day.

The receiving house, with a capacity of 40 to 45 cu. yds. of crude refuse, is equipped to minimize the dust problem. A conveyor delivers the refuse to a picking table and under a magnetic separator to extract cans and ferrous metals. The picking table has a speed of 90 ft. per minute and chutes are provided for textiles, non-ferrous metals, inert debris, glass bottles and jars. Dust extraction is provided at the picking table. On the lower floor, there are balers for tin and for textiles.

After metal extraction and picking, the remaining materials are fed into the Dano Bio - Stabilizer, being mixed with the detritus sludge. The drum rotates at 0.8 rpm during the day and at 0.2 rpm at night and over week-ends; 5 days are required for passage through the drum with accompanying stabilization at about 135°F. The material is then screened and a glass extractor removes the small inert particles. Operating data are not yet available.

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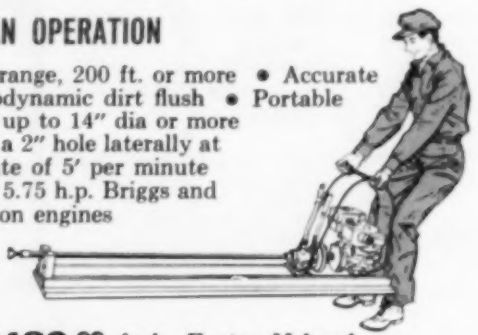

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ROADWAYS. Polysulfide-modified mortars patch potholes and fill ruts and dips. In this application, adhesive and aggregate are mixed in a ratio of 1 to 5, spread and troweled like concrete. Digging down to bedrock or exposing steel reinforcements and pouring new concrete (conventional repair techniques which tie up traffic for days) is avoided. Polysulfide-modified mortar cures fast. Time, labor and the public temper saved.

FLOOR PATCHING. In plants where regular concrete has broken down under exposure to abusive traffic, chemicals or corrosive agents, mortars with THIOKOL polysulfide polymer have stood the test of time and wear.

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MOTOR GRADER Performance Tests

H. A. RADZIKOWSKI
Chief, Division of Development
Bureau of Public Roads
Washington, D. C.

SEVERAL years ago, the Bureau of Public Roads was requested by the General Services Administration to prepare the Federal Interim Specification for Motor Graders. One of our first steps was to contact the manufacturers for their recommendations.

Our analysis of manufacturers' published literature and engine performance curves revealed that the industry had no fixed rules for rating the power available, and brake horsepower had become somewhat of an intangible. We found at least four methods of rating available horsepower on motor graders which were supposed to be competitive in working ability. These were: 1) Gross maximum duty horsepower without deductions for such power absorbing accessories of the engine as generator, fan, fuel, water pumps, etc.; 2) gross intermittent duty horsepower without deductions for the power-absorbing accessories of the engine; 3) intermittent duty horsepower with deductions for some of the power absorbing accessories of the engine; 4) net intermittent duty horsepower with deduction for all power absorbing accessories of the engine.

For actual comparative purposes, only the horsepower rating based on Item 4 was significant and it was used as a preliminary rating criterion pending the development of more exacting criteria.

In addition to the net intermittent horsepower rating, the work ability at the blade depends on such other factors as weight distribution, general machine balance, transmission type, and gear train efficiency. The only practical way to integrate all these factors into a performance rating was to measure the tractive effort or blade pull available at the moldboard—the working end of the motor graders—for a reasonable ground speed range.

The preparation of a Federal Specification requires the joint effort and cooperation of both industry and the Government. A preliminary meeting was held with representatives of Federal agencies to obtain and correlate their requirements for motor grader applications. Following this, a joint meeting was held with representatives of all motor grader manufacturers and representatives of interested Federal agencies to discuss and correlate a preliminary set of requirements, including many items involving machine performance such as tractive effort, engine cooling, engine smoke conditions, wheel lean, and many others.

Following this meeting, a specification draft was developed which embodied the general agreements reached by grader manufacturers and Government representatives on performance criteria and testing procedure. A second joint meeting was subsequently held with industry and Government agencies to obtain final concurrence on both the proposed requirements and procedure.

The Bureau of Public Roads obtained the cooperation of the Corps of Engineers, U. S. Army, in having these tests made at their Engineer Proving Grounds at Fort Belvoir, Virginia, with the manufacturer contributing to the over-all costs.

The blade pull tests and tests for compliance with other performance requirements were conducted during 1958 and 1959 and provided suf-

Sand - Cinders - Salt
for Safe Winter-time Driving

Your winter-time Ice and Snow headaches start again in about 4 months. Are you all set to start sanding? You will be if you have these **tough, rugged Tarco "Arcrite" spreaders** to work with.

The Tarco "Arcrite" has everything you need. **Rugged gasoline engine.** Special **'No-Load" engine starting** assembly, Cog-type "B" **belt and heavy roller chain drive.** Thick **vertical shaft is bearing supported.** Adjusts to tail gate in any position without use of auxiliary chute. Gate-type material controls. **Safety guard rail.** Remote throttle control. **Air filtered engine** compartment.

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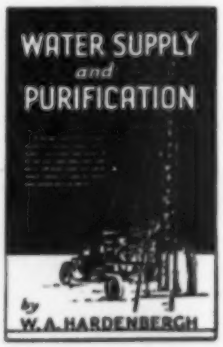
by Col. W. A. Hardenbergh



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Among the major changes introduced in this latest edition are the following: the chapters on ground water, on filtration, and on laying pipe and maintenance lines have been almost completely rewritten; the chapters on pipe conduits and on desinfection have been revised to bring the material in them up to date and a new chapter has been added on fluoridation.

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FOR AREAS ADJACENT TO SENSITIVE CROPS—LINE RIDER AMINE 22, an alkyl amine salt formulation of 2,4-D and 2,4,5-T with 2 pounds each acid equivalent per gallon. Applied as a water-borne spray.

FOR SPECIAL CONDITIONS—Available are other standard LINE RIDER formulations, including Butyl and Low Volatile Esters of 2,4-D and 2,4,5-T containing 4 pounds acid equivalent per gallon.

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ficient information to establish performance criteria in nearly all sizes and classes which are available on the market today. Preparation of the final draft of the Interim Specification is now going forward. In accordance with procedures developed by the Society of Automotive Engineers for testing pneumatic-tired equipment, the tractive effort tests were conducted on a concrete-paved testing course in order to assure repeatability and a valid comparison of available power. Each model was tested through the working ability of each speed range; after the point of maximum power was established, confirming runs were made at the applicable pull and ground speed.

Tractive effort requirements will be based on a curve drawn through the maximum power points for a speed range of from 2 to 10 miles per hour which will embrace the practical work range of most tasks performed by a motor grader, including snowplowing functions. Since blade pull and blade horsepower are interchangeable for a given ground speed (ie. blade horsepower=blade pull in lbs. x ground speed), 375 basic horsepower rating is being designated at a 3.0 miles per hour ground speed. The tractive effort curve will pass through this point.

A basic blade horsepower rating for motor graders at a 3.0 mile per hour ground speed will be established which will enable us to obtain a relationship with the net intermittent horsepower rating and provide a means by which the manufacturer can estimate the ability of his machine to qualify under the established tractive effort requirements. Some of the physical characteristics of a motor grader have a bearing on performance. Weight and its distribution are quite important.

Under our proposed motor grader rating criteria, the two basic requirements will be 1) Fully serviced weight and 2) blade horsepower at 3.0 mph.

Fully serviced weight is used rather than dry weight because blade horsepower and other tractive effort values are obtained in operating condition. Such weight includes fuel, oil, water and standard accessories, but not hydro-inflation, other ballast, or an operator. Weight distribution is quite important for tandem drive graders and our tentative requirement calls for from 65 to 75 percent of the total weight on the drivers.

In addition to the tractive effort requirements through the 2 - 10 mph speed range, a motor grader is required to meet a number of other performance requirements. Some of these are of a functional nature and involve the operating characteristics of working assemblies, and others are directly related to over-all work performance.

Functional Requirements and Tests

Minimum lean of front wheels on tandem drive graders is 15° right and left from the vertical. Adequate wheel lean prevents scarring of the ditch sides, shortens turning radius, and permits riding of the slope.

Side shift of circle and moldboard is variable with the several sizes and classes and is important in ditch sloping activities when the driving wheels must be kept on firm footing.

Moldboard rotation of 360° is required on all but the smallest size grader and is essential where turning is impractical or time consuming and the job is of a nature that progressive work may be accomplished in both directions of travel.

Normal operating range of moldboard from operators' quarters is particularly important in maintenance operations where a grader-man is working by himself and does not have the observation and advice

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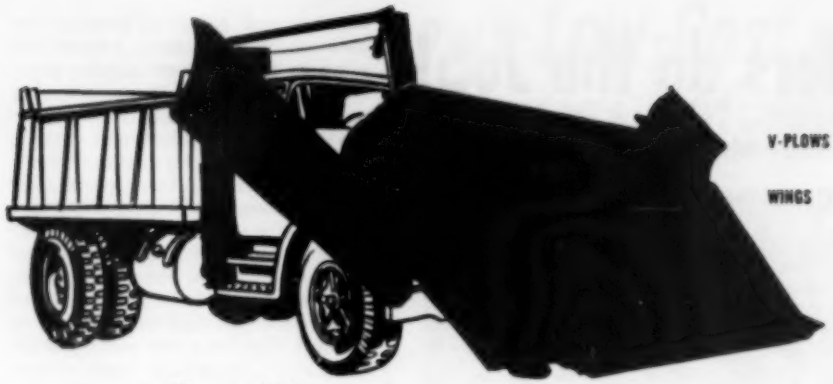

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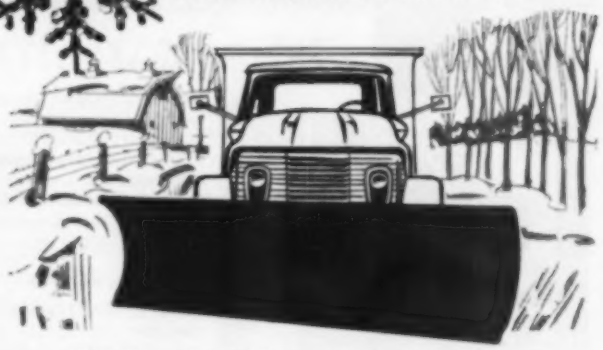

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of a second party in moving the blade from a ditching position on one side to a 45° bank sloping position on the other. The movement must be made without interference from the scarifier block and without the operator leaving his quarters.

Ground level blade positioning for minimum 45° sloping angle determines the ability of the grader to bank-slope without serious under-cutting at the toe of the slope. The tentative standard requirement states that the heel of the blade at ground line for a 45° cutting position shall extend at least to the center of the tires. For special service condition such as for bank sloping on extremely winding alignment, the blade must extend to a point even with the outside line of the tires.

Shifting of moldboard to maximum bank cutting angle of 90° on the right and 80° on the left enables the grader to slope loess and other soils where weathering and erosion are minimized with a nearly vertical slope.

Raising and lowering of moldboard to determine clearance and cut below ground are indicative of travel ability and work potential, respectively. For efficiency, a minimum lowering and raising speed for the moldboard of two inches per second is required with approximately equal rates of travel for each side of the moldboard.

Other Performance Requirements and Tests

In addition to the tractive effort requirement and test previously described, there are several other actual performance requirements which require tests. These include:

Engine exhaust smoke condition which is measured during the tractive effort tests during a sustained pull, is indicative of fuel consumption efficiency at full throttle. Our original requirement of operation "without smoke in excess of No. 2 as described in Military Specification MIL-E-11278-B" was found to be somewhat restrictive. This requirement has been reduced to provide for a smoke of not in excess of No. 3 as per the previous mentioned specifications. A No. 3 smoke is described as "Light Gray."

Engine cooling system efficiency requires a maximum air to water-out temperature of not more than 85° F for a sustained pull of 10 minutes while operating at a maximum power output in an ambient temperature range of from 50° F to 90°F. Our original requirement called for a temperature differential

of not over 90°F, but it was tested during the work production tests when the operators were striving for work output rather than a cool engine. Adequate cooling is important under most working conditions and is critical when torque converter drives are used, since it must dissipate that heat resulting from the drop in energy. For torque converter models, the tentative specification requires an increase of at least 15 percent of cooling capacity over that required for the same motor grader when a friction clutch transmission is used.

Service brake performance is a safety requirement. Such brakes should be capable of stopping the grader from a speed of 15 mph within 25 feet on a dry, smooth and level concrete surface. The test provides for six runs, all of which must be within the previously mentioned requirements.

Parking brake performance is also a safety item. The requirement provides that the parking brake must be capable of locking the grader wheels on a 20 percent slope. The grader is tested in both an uphill and downhill position.

Over-all workability and production capacity is determined during a work period of about four hours of operation on a 500-ft. test course. The work performed includes: Ditching, spreading, coarse grading, fine grading, scarifying, bank sloping and windrowing.

The ability to perform these various operations is observed and recorded. Quantitative information on the amount of work is also determined and recorded, but the information developed to date is not considered adequate to establish definite minimum production quantities for a specified period of time. As more information is developed, we hope to establish some work production requirements.

Minimum turning radius is an optional requirement for special service conditions involving maintenance on narrow winding roads with single track bridges and is one of the tests performed. The minimum turning radius is measured to the tread of the outside front tire.

Motor graders which satisfy the requirements of the approved Federal Specification will be placed on a Qualified Products List (QPL) and will be acceptable for Federal procurement purposes with a minimum of factory inspection and other qualification procedures. It is our hope that this will result in savings of time and money both to the manufacturer and the Government.

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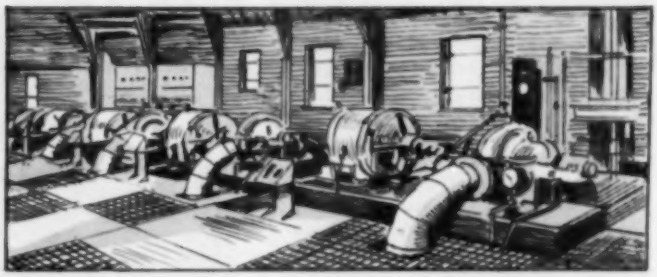

Prepared by **ALVIN R. JACOBSON, Ph. D.**

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

Sodium Aluminate As A Coagulant

In 1959, a new form of sodium aluminate was used with considerable success as a coagulant in the lime-soda ash softening plant in Council Bluffs, Iowa. The plant is operated as a two-stage split treatment, clarification and softening plant. The use of the new sodium aluminate in conjunction with lime-soda ash softening has proved successful and has several advantages over the use of alum: 1) Coagulant requirements are well defined and simple to control; 2) although the cost of 1 ppm sodium aluminate is equivalent to the cost of 3.68 ppm alum, the smaller dosage requirements of sodium aluminate make it more economical than alum; 3) lime requirements are smaller for alkali and magnesium reduction: 4) soda ash requirements were substantially reduced, resulting in significant cash savings; 5) filter beds stay in better condition.

"Use of Sodium Aluminate as a Coagulant at Council Bluffs." By Myron E. Rew, Mgr. of Operations, City of Council Bluffs, Iowa. *Journal A.W.W.A.*, July, 1960.

Limnological Investigations

During 1959 a rather intensive analysis of many of the chemical, physical and biological parameters useful in measuring surface water quality were performed on the water of University Lake, the source of water for Chapel Hill, N.C. This reservoir, which drains 30 square miles of agricultural land, contains about 500 million gallons and has a maximum depth of 30 feet. Early in June, 1959, an unusual taste and odor problem developed in the raw water supply which could not be readily controlled by conventional water treatment procedures. However by the use of limnological techniques the distribution of the odor in the reservoir was established and steps were taken to avoid the odor-bearing water layers. In summary, it was concluded that the odor was associated with the chlorophyll extract obtained from water samples taken from the 6 to 8-ft. levels and passed through membrane filters. The immediate solution of the odor problem was to construct an intake at a depth of 2 feet below the surface where no odor was found. Although deeper water would have provided essentially odor free water and colder water, the high iron and manganese content would have necessitated additional treatment.

Fresh Water from the Sea at Low Cost

THE PRIME contract for construction of a 1,000,000-gallon per day sea water conversion plant at Freeport, Texas has been awarded to Chicago Bridge & Iron Company, Chicago by the Office of Saline Water, Department of the Interior. This conversion plant is the first of five saline water conversion plants authorized by Public Law 85-883. The process to be utilized in the plant—long-tube vertical multiple effect distillation—incorporates several newly developed technical innovations resulting from OSW sponsored research. The plant is expected to produce fresh water from the sea for less than $1 per thousand gallons. Contract specifications call for construction and start-up operations to be completed in 330 days; 270 days for construction and 60 days for operational testing before the completed plant is accepted.

● **INSPECTING** scale model of 1 mgd sea water conversion plant. Left to right: J. L. Miller, CB&I; Allan Cywyn, OSW; S. L. Luce, CB&I; Dr. A. L. Miller, OSW.

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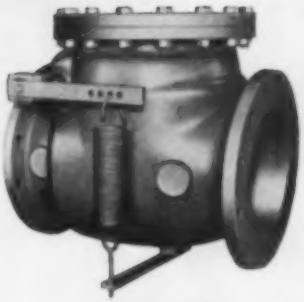

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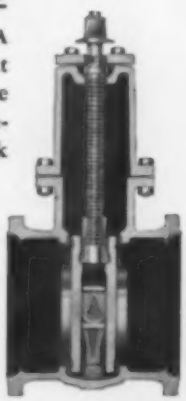

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WATERFORD NEW YORK

"Limnology and Quality of Raw Water in Impoundments." By Charles M. Weiss, Associate Professor of Sanitary Science and Ray T. Oglesby, Research Fellow, Dept. of Sanitary Engineering, University of North Carolina, Chapel Hill, N.C. PUBLIC WORKS, August, 1960.

Radioisotope Removal

The municipal water system of Pasco, Wash., is typical in design in that it provides for chemical coagulation, sedimentation and filtration together with chlorination. The system is quite unique, however, in that the Columbia River Water being treated contains radioactive materials from the Hanford Atomic Products Operation (HAPO), which is one of the nation's major plutonium production facilities. The Pasco treatment facilities are approximately 39 mi. downstream from the nearest of eight reactors using Columbia River water as coolant on a once-through basis with the effluent being returned to the river. As the cooling water passes through the reactor, some of the minerals become radio-active, primarily because of neutron capture reactions. In addition some radionuclides are produced as a direct result of the fission process. The Columbia River contains trace quantities (approximately 1 ppb) of natural uranium which is not entirely removed in the cooling water treatment process and as a result passes through the reactors. Fission products result from this process. More than 60 radionuclides have been measured in HAPO reactor effluent water; in fact are measured routinely. All of the radionuclides with short-lives are reduced to insignificant levels before reaching the Pasco water treatment plant. In fact the gross content of radionuclides has been decreased to a few percent of the original level by radioactive decay alone. The treatment at the Pasco water plant consists of chemical coagulation, sedimentation, filtration and chlorination and has been effective in removing radionuclides although no special precautions have been needed. The primary emphasis has been placed on adequate control of the concentration of radionuclides permitted in the effluent from the Hanford reactors thereby reducing the problem of removal at the Pasco water plant.

"Removal of Radionuclides From the Pasco Supply by Conventional Treatment." By Robert L. Junkins, Sr. Eng., General Electric Co., Richland, Wash. *Journal A.W.W.A.*, July, 1960.

Wichita's Water Works

Wichita, Kansas, is providing for its present and future water needs with adequate planning and financing. Prior to 1956 the City owned the well fields and treatment facilities but the distribution system was privately owned. At that time the voters approved the purchase of the distribution system for $31,350,866, facilitating the completion and financing necessary for future developments. Ever since 1940 when the City first entered the picture by developing a field of 25 wells, constructing 26 miles of pipeline and erecting a purification plant, steady progress has been made in extension of the source of supply until at present there are 88 wells. The water supply developments have come in three stages: A 1947-48 expansion to match somewhat the wartime growth of the community; the 1952-59 construction to expand supply, transmission and treating capacities; and the purchase in 1957 of the private distribution system. Chlorine is

the Old Shell Game

M & H does not believe that a business transaction should be a gamble, with either buyer or seller looking out for himself at his own risk. From the beginning of its career, the M & H Management has realized that a customer should become a friend. A customer should really be a silent partner—and not always silent, either, because his honest advice and opinion are extremely valuable.

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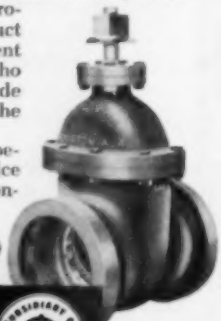

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This 43,000-foot line of 18-inch pipe serves the City of Winchester, Ky. and runs, mostly up and down, from the Kentucky River to the treatment plant, and then on to the standpipe in town. Consultants were J. Stephen Watkins, Consulting Engineers, Lexington, Ky. The pipe was manufactured by Price Brothers Company with headquarters plants in Hattiesburg, Miss. and Dayton, Ohio.

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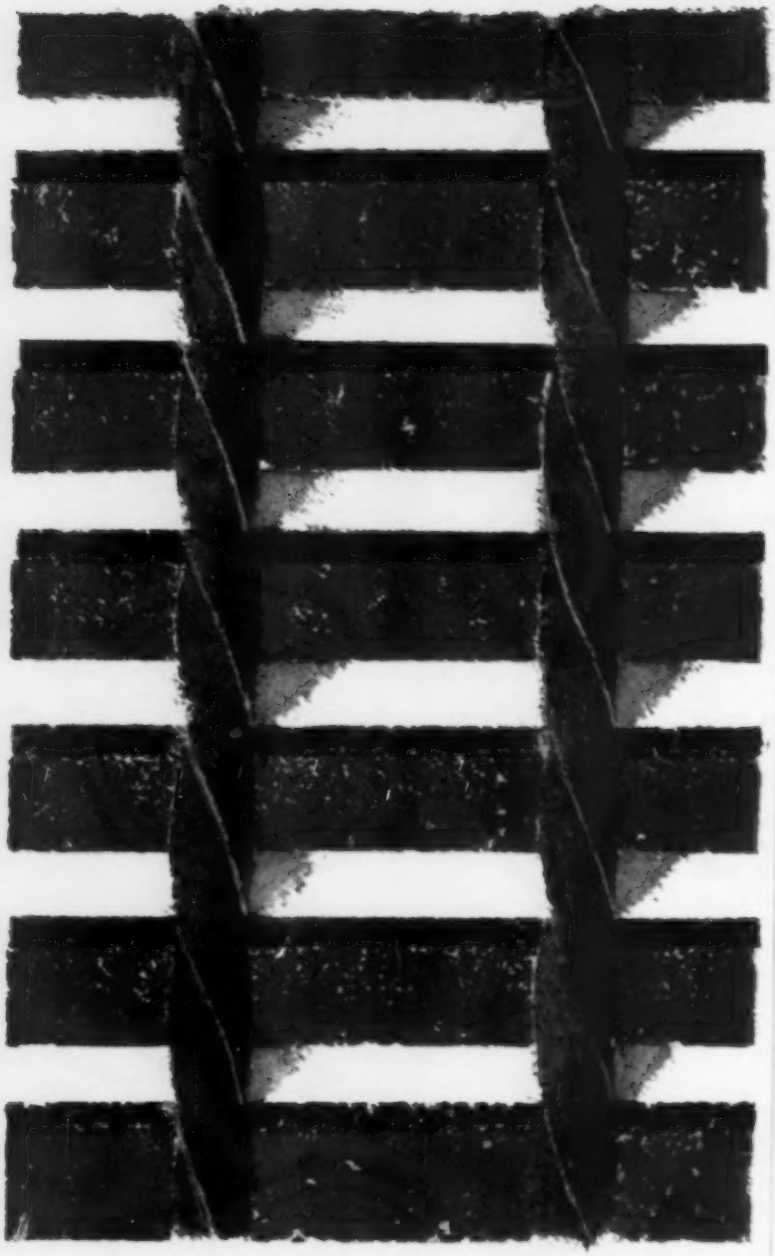

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added to the pipes in the well field to prevent the growth of iron bacteria. Water treatment consists of the removal of iron manganese, and hardness accomplished by aeration, flocculation, sedimentation and filtration. Filters are operated at a rate of 4 gallons per square foot per day. Surface backwash equipment is provided on all filters. Two current developments at present are: 1) The strengthening of the distribution system by the addition of transmission mains and elevated storage tanks; and 2) approval for a multi-purpose reservoir to be built jointly by the city and federal government.

"Wichita's Water Works in Transition." By Robert H. Hess, Director of the Water and Sewage Treatment Dept., and Madison F. West, Information Officer, Ctiy of Wichita, Kansas. *American City*, July, 1960.

Corrosion and Red Water Control

The results of distribution system corrosion are well known. Theories explaining the cause, together with practical means of controlling corrosion, have been advanced from time to time; yet water quality continues to deteriorate in the distribution system. The author describes in this article a practical means of insulating pipe from attack through careful control of calcium carbonate and polyphosphate content. On the basis of a large number of laboratory and one field study with a 6-inch cast iron pipe it has been shown that a satisfactory base coat of calcium carbonate can be developed on iron pipe in 2 hours. By maintaining a phosphate level of 0.25-0.50 mg/liter and momentary excess of 12-15 mg/liter of calcium carbonate in the distribution system this coating should improve with time. Additional testing with a number of waters is essential to define further the optimum levels of polyphosphate, driving force index (DFI), and momentary excess (ME) which should be maintained during the 2-hour period.

"Calcite Coating Protects Water Pipe." By R. F. McCauley, Assoc. Prof., Dept. of Civil Engineering, Michigan State University, East Lansing, Mich. *Water and Sewage Works*, July, 1960.

Sulfamic Acid-Chlorine Residuals

Many studies have previously been made to determine if a more effective use of chlorine could be es-

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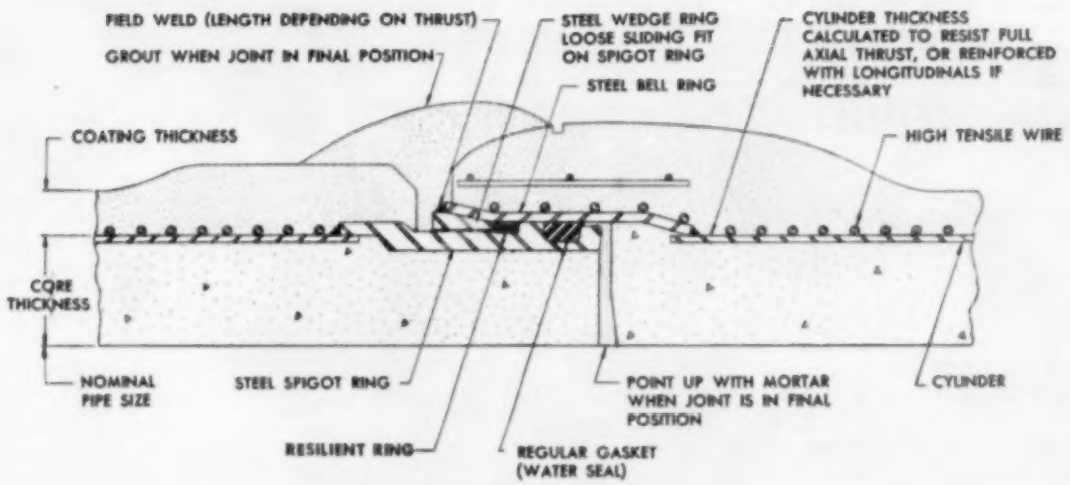
FIELD WELD (LENGTH DEPENDING ON THRUST)
GROUT WHEN JOINT IN FINAL POSITION
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STEEL BELL RING
CYLINDER THICKNESS CALCULATED TO RESIST FULL AXIAL THRUST, OR REINFORCED WITH LONGITUDINALS IF NECESSARY
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A greater measure of flexibility is imparted to this field-welded joint by the resilient ring, located between the weld and the watertight rubber gasket seal. This ring also improves the tensile characteristics of the joint by distributing the load more evenly around the periphery of the joint ring.

Detailed description of this joint may be obtained from Lock Joint Pipe Company on request.

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tablished, thereby assuring a better bacterial kill under all conditions. This present study entails the study of sulfamic acid (NH_2SO_3H) in combination with chlorine in various concentrations. It was found that the sulfamic acid and chlorine combinations gave reactions similar to those of chlorine alone in liberating iodine from iodides, reduction by thio-sulfate, and quantitative reaction with o-tolidin, so that direct measurements and comparisons with chlorine are possible. It was concluded that a given amount of chlorine, properly mixed with sulfamic acid will give greater kills of bacteria than the same amount of chlorine alone or as chloramine. The active residuals of such mixtures can be measured by the usual o-tolidin technic. The OTA technic does not appear to be of use. Subject to further study, it seems preferable to add the chemicals in sequence rather than after mixing. Loss of active chlorine due to sunlight, wind and splashing, and casual organic matter are definitely reduced.

"A Laboratory Study of Sulfamic Acid as a Vehicle for Chlorine." By Joseph A. McCarthy, Chief, Lawrence Experiment Station, Mass. Dept. of Public Health, Lawrence, Mass. *Journal of the New England Water Works Association*, June, 1960.

Other Articles

"We Use **An Undrinkable Water**" by desalting it in the nation's first water-demineralizing plant, thereby cutting supply costs 80%. By R. O. Phelps, Director of Public Works, Coalinga, Calif. The American City, July, 1960.

"A Pilot Plant for **Water Treatment** and Its Operation at Middleton Pond, Massachusetts." The pilot plant provides coagulation, sedimentation, and filtration. By William B. Davis, Graduate Student, Dept. of Sanitary Engineering, Mass. Institute of Technology, Cambridge, Mass. and H. J. Steinhurst, Associate Sanitary Engineer, Mass. Dept. of Public Health, State House, Boston, Mass. Journal of the New England Water Works Association, June, 1960.

"**Sealing a Small Dam**" at Groton, Connecticut, without draining the reservoir. By Gordon E. Thomas, Project Engineer, Metcalf & Eddy, Engineers, Boston, Mass. PUBLIC WORKS, August, 1960.

"Significance of **Radiation in Water Supply** and Treatment." Ionizing radiation is a form of energy, and if this energy is absorbed by man's tissue, injury can occur. By Herbert A. Bevis, Chief, Ionizing Radiation Branch, Div. of Occupational Health, State Dept. of Health, Austin, Texas. Journal A. W.W.A., July, 1960.

"**Reservoir Clearing** Operations Yield a Profit." About 500 acres have been cleared by contract during the last 3 years for which the Bureau of Water received approximately $1,600,000 from the timber removed. By H. Kenneth Anderson, Chief Engineer, Bureau of Water Works, Portland, Oregon. PUBLIC WORKS, August, 1960.

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(*Continued from page* 116)

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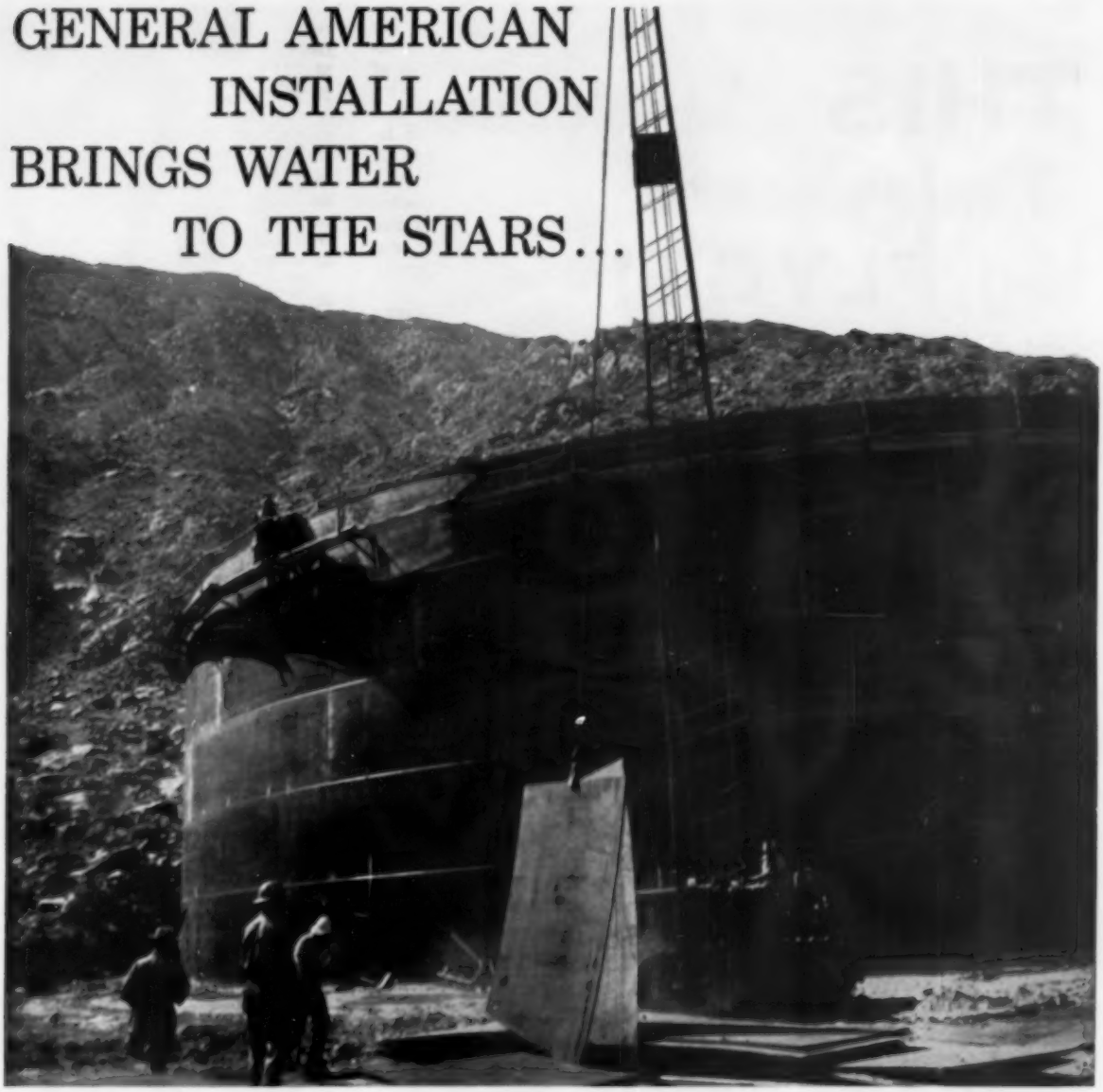

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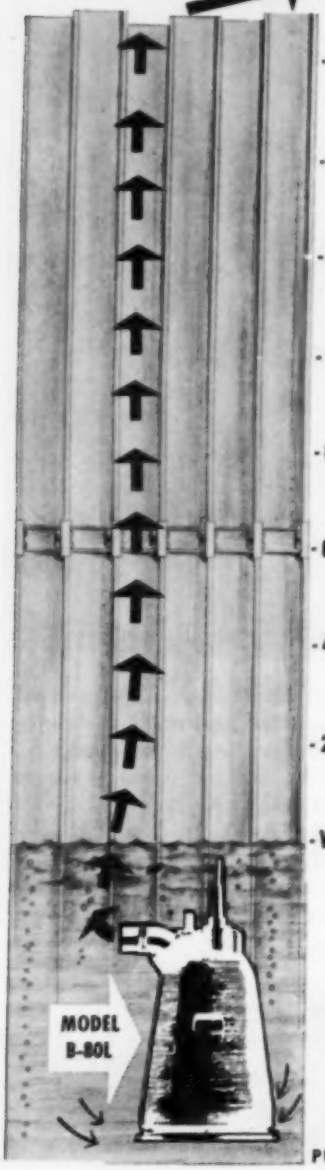

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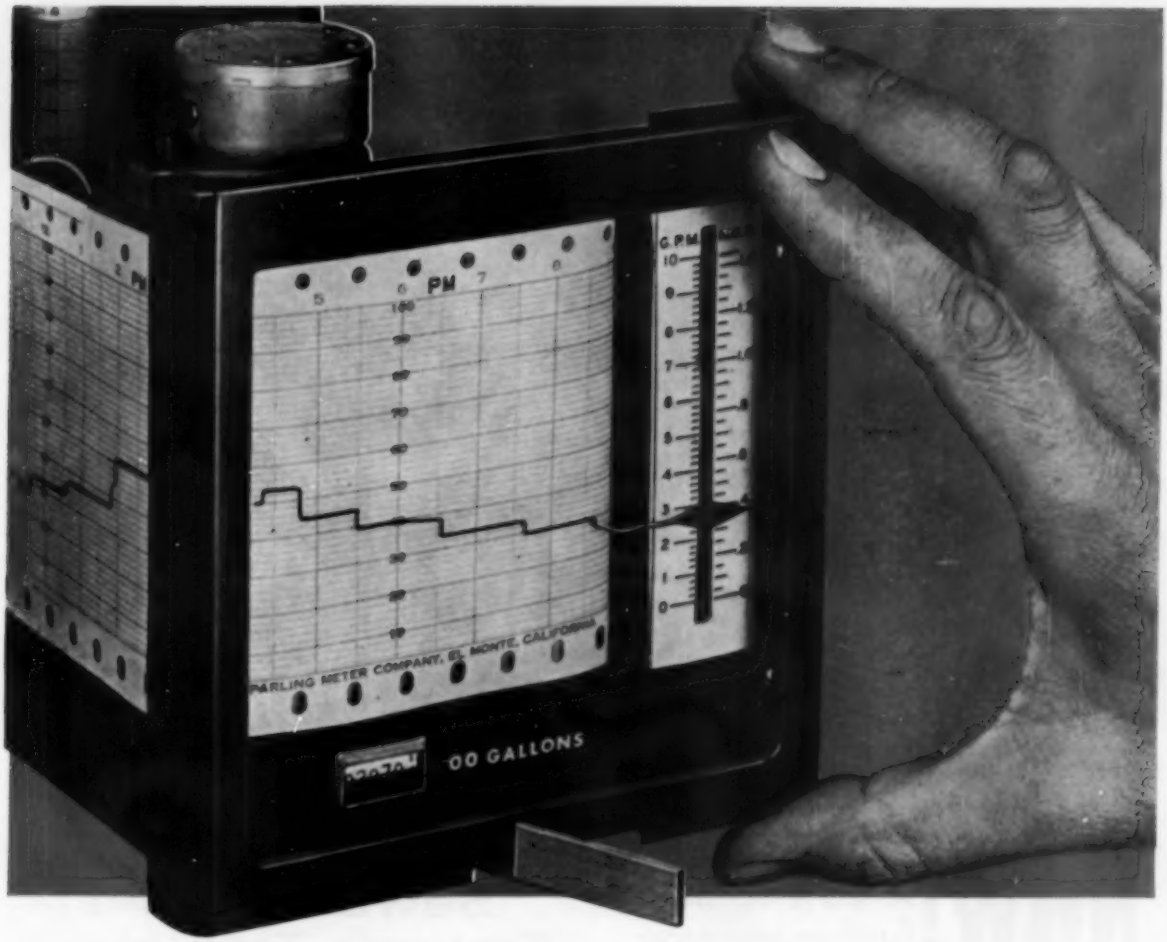

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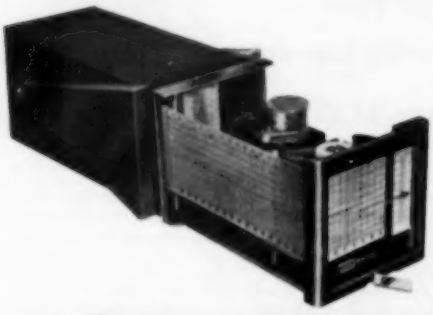

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Air Pollution and the Courts

(*Continued from page* 105)

local laundry company had sought to obtain a writ in the United States District Court to enjoin the enforcement of the city's smoke control ordinance on the grounds that it was a denial of the due process of law and equal protection of the laws clauses of the Federal Constitution. The writ was denied, and appeal was taken to the Supreme Court.

In upholding the ruling of the lower court, the Supreme Court stated in its decision: "So far as the Federal Constitution is concerned, we have no doubt that the state may itself, or through authorized municipalities, declare the emission of dense smoke in cities or populous neighborhoods a nuisance and subject to restraint as such; and that the harshness of such legislation, or its effects upon business interests, short of merely arbitrary enactment, are not valid constitutional objections. Nor is there any valid federal constitutional objection in the fact that the regulation may require the discontinuance of the use of property, or subject the occupant to large expense in complying with the

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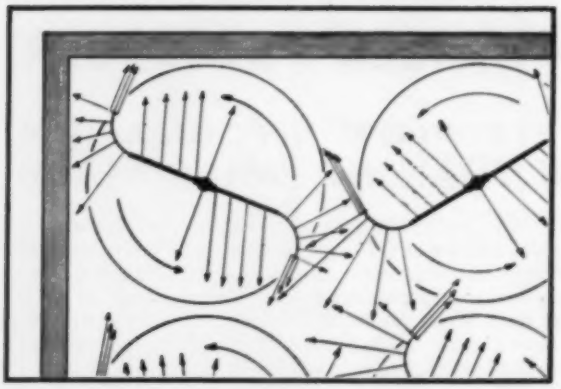

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terms of the law or ordinance." (6) The court cited numerous other decisions to the same effect.

In the Detroit case of 1960, a company maintaining a fleet of vessels was taken to the Recorder's Court in a criminal action for violation of the city's smoke abatement code. The company sought to enjoin this action by a writ from the State Circuit Court, but was refused the writ, an action upheld by the Supreme Court of Michigan (7). Appeal on constitutional grounds was then taken to the Supreme Court of the United States. The defendant alleged that the local action was an interference with interstate commerce, pointing out that the boilers on his ships had been inspected, licensed, and approved by a federal agency, the U.S. Coast Guard.

The Supreme Court, however, sustained the judgment of the highest state court (8). "The ordinance," said the court, "was enacted for the manifest purpose of promoting the health and welfare of the city's inhabitants. Legislation designed to free from pollution the very air that people breathe clearly falls within the exercise of even the most traditional concept of what is compendiously known as the police power." The court also pointed out that Congress in enacting the national air pollution act of 1955 had expressly recognized that the problem of air pollution is peculiarly a matter of state and local concern. The Detroit ordinance was said to be a regulation of general application, designed to better the health and welfare of the community, and as such does not discriminate against interstate commerce.

Two of the nine justices, Messrs. Douglas and Frankfurter, dissented from the majority opinion. They felt that the local ordinance clearly was in conflict with paramount federal law, and that what was involved here was more than a mere inspection law under the vested police power of the State. Their views are interesting, but it is the majority which makes the law.

Prior to this significant decision, in 1956, the Supreme Court of the United States had refused to review the convictions of several industrial firms in California for violations of the Health and Safety Code on air pollution of Los Angeles County, enacted in accordance with the state law of 1947. (9)

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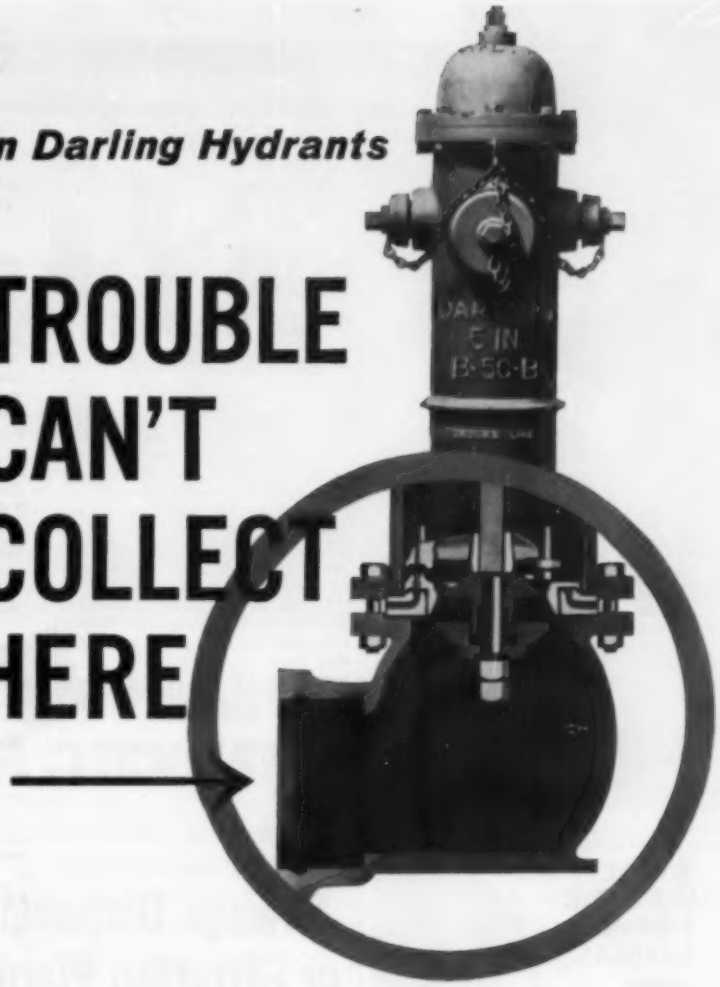

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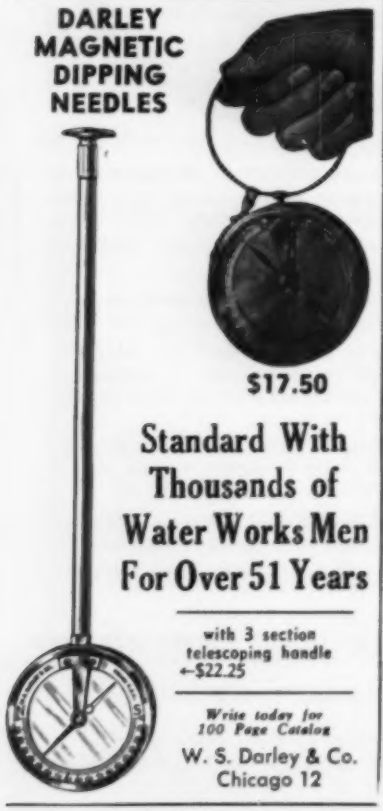

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Court has upheld several other convictions in lower courts for violation of the smoke control laws, usually involving fires on privately owned dumps. (10) The Superior Court in Pennsylvania likewise has upheld similar convictions, stating that a property owner is responsible for smoke from fire in a dump even though the fire had started there before the present owner acquired possession. (11)

Liability for Air Pollution

In 1959, the Supreme Court of the United States refused to review a decision of a United States Court of Appeals upholding an award for damages against an industrial company for injuries to an individual caused by poisonous fumes from the company's plant in Oregon. (12) In the United States District Court the jury had found, as a matter of fact, that the plaintiff himself and his property had been harmed by fluorides discharged from the company's neighboring aluminum reduction plant. This case was predictated upon the doctrine in the law of torts, or legal wrongs, known as *res ipsa loquitur*, in which negligence need not be proved but can be inferred from the facts shown. In other words, the thing speaks for itself.

Another similar case decided about the same time, in the United States Court of Appeals in Utah, approved damages for injuries due to discharge of fluorides in several instances, where actual damage could be proven. (13)

While every citizen has the legal right to the use and enjoyment of pure air, this right is not an absolute one but may be qualified to some extent by local circumstances. Thus, if a citizen deliberately chooses to live in a heavily industrialized area, or beside a city dump, he must expect some discomfort from air pollution. The courts have held, in fact, that by such a choice the citizen surrenders in part his privilege of pure air, but this fact does not absolve the industries or the operators of dumps from using every reasonable means to prevent or reduce air pollution. If they are truly negligent in this duty, they will be liable.

In a recent Pennsylvania case it was held that there was no liability for fumes or noxious gases under the peculiar circumstances of the particular case. (14) In the American Law Reports in which this case appears there is an extensive and valuable review of the law on this

subject in the various states (54 ALR 2d 748).

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Nationwide Reporting of Fish Kills

A nationwide system of reporting the frequency and locations of fish killed by pollution was started in June by the Public Health Service which has asked State fish and game conservation agencies to provide continuing reports of fish killed by pollution as these occur in the rivers, lakes and coastal waters. Reports will be made to the Public Health Service in Washington. Upon receipt, copies will be made available to the Fish and Wildlife Service of the Department of Interior which is cooperating on the project.

This is the first time that a national tabulation of the numbers of fish kills has been undertaken and the information will be published quarterly and annually with fish kill numbers, locations and causes, when known. Reports will be distributed on request.

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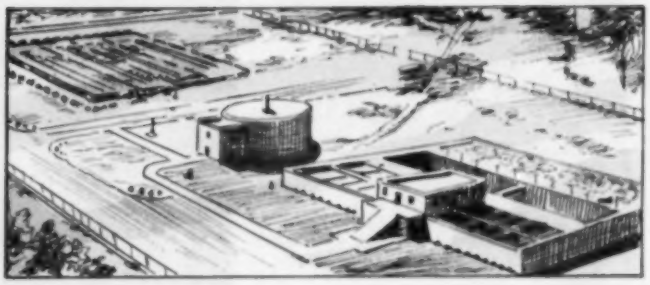


Prepared by **ALVIN R. JACOBSON, Ph.D.**

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

BOD

Progression

The most important single characteristic, from the standpoint of waste water treatment and water pollution control, is the amount of oxygen utilization due to the aerobic action of bacteria and protozoa feeding on the organic constituents of the wastewater. The standard procedure for evaluating this oxygen requirement is the biochemical oxygen demand determination. An investigation was made of the selective stimulation of respiration in mixed cultures of bacteria. The study utilized both manometric and dilution techniques in BOD measurements. The following conclusions may be drawn: 1) The progression in soluble substrates of BOD exerted by mixed cultures of sewage organisms seed is a multistage reaction. A plateau occurs in the oxygen consumption curve on completion of direct substrate oxidation. The rate and path of the progression can be altered appreciably by the use of an approximate inhibitor of assimilation (synthesis) processes and yet produce five-day BOD values which are within the accepted standard deviations for these substrates with the dilution technique; 2) it is possible selectively to stimulate the respiration (oxidation) of glutamic acid, glucose, and a 1:1 mixture of these compounds by a mixed culture of microorganisms with sodium azide; 3) a critical concentration of sodium azide significantly prevents synthesis and forces the reaction in the direction of complete oxidation to carbon dioxide and water as shown by increased plateau values.

"The Selective Stimulation of Respiration in Mixed Cultures of Bacteria and Protozoa." By Nugent Myrick and A. W. Busch, Respectively, Graduate Assistant and Fellow, and Assistant Professor, Department of Civil Engineering, The Rice Institute, Houston, Texas. *Journal Water Pollution Control Federation*, July, 1960.

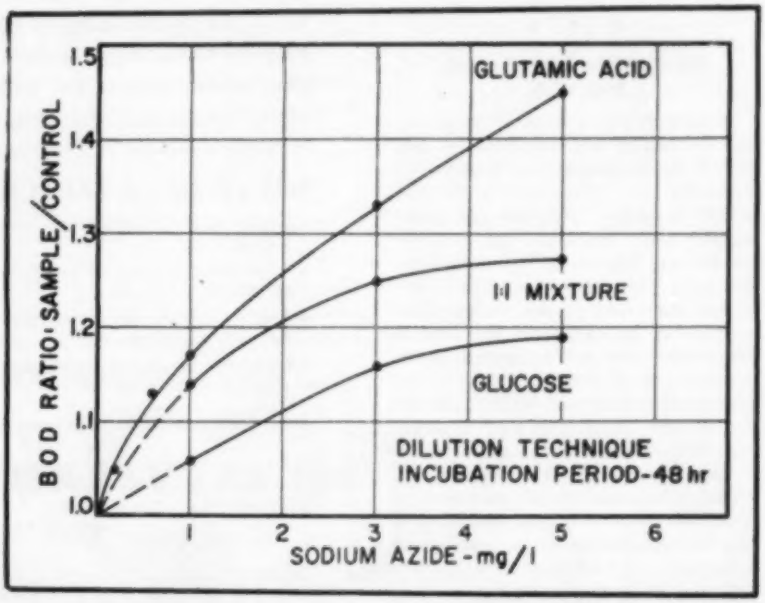
Sewage Treatment for The Winter Olympics

For years all the homes and lodges in the Squaw Valley area had used septic tanks and leaching fields. When this area was chosen for the winter Olympic games and the sum of $14 million became available for construction and improvements, conditions were changed materially. Based on the criterion that any effluent reaching Squaw Creek or a usable ground water stratum must meet PHS drinking water requirements, a plant was designed which was simple to operate, prefabricated so far as possible; salvable; and operable under deep snow. A Chicago Rated aeration plant was used for the primary oxidation component and a sand filter for the final treatment, this to operate at 10 gals. sq. ft./day. The results have been fully satisfactory. Some details of design are given.

"Squaw Valley Fringe Area Sewage Treatment Plant." Philip Noel Storrs, Roy Edwin Ramseier & Assoc. PUBLIC WORKS, August, 1960.

Sludge Flow Equations

The problem of designing pipelines to carry sewage sludges involves the fundamental flow properties of the sludges. The flow properties of these sludges must be analyzed by at least two parameters,



Courtesy Water Pollution Control Journal

EVALUATING oxygen requirements using manometric and dilution techniques.

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i.e., shear stress-shear rate relationships which do exist in contrast to water which is specified by one flow parameter, the viscosity. In this report two types of non-Newtonion fluids, the Bingham plastic and the pseudoplastic, have been given special attention because of evidence that sewage sludges may be reasonably classified as such. For these two classifications, mathematical models of the shear stress-shear rate relationships are available. These equations may be integrated for the boundary conditions imposed by capillary and rotational viscometers. The resulting equations contain the basic flow parameters, and thus an avenue is opened for the experimental determination of these parameters. Furthermore, it is possible to derive modified Hagen-Poiseuille and Reynolds Numbers which permit the calculation of pressure drop by the usual techniques. Most importantly, similar equations can be derived without specifying shear stress-shear rate relationships. The relationships are, therefore, completely generalized. Due to a relatively broad application with miscellaneous non-Newtonian fluids, some empirical relationships are available between friction factor and generalized Reynolds Numbers. Therefore, with the aid of viscometry, some estimates can now be made of pressure drops in pipelines used to carry sewage sludges.

"Flow Equations For Sewage Sludges." By Vaughn C. Behn, Associate Professor of Civil Engineering, University of Delaware, Newark, Del. *Journal Water Pollution Control Federation*, July, 1960.

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Synthetic Detergents

Since the advent of synthetic detergents great concern has been shown by sewerage authorities who have been experiencing troubles in operating their plants and in producing satisfactory results. Similarly, concern has been expressed by river boards because of foam and possible effects on fish life, and by water authorities, some of which were finding traces of active material in water provided for public supply. In 1953 a committee was set up by the Minister of Housing and Local Government in England to examine the whole situation and to make recommendations. Since that time several papers have been given showing the nature of the problem and developments being made to alleviate the situation. The most important recommendation was that manufacturers of household detergents should investigate the feasibility of producing efficient washing products based on materials which can be oxidized or eliminated, and will not cause persistent foaming during sewage treatment by present available methods. The manufacturers were quick to accept the recommendation and the investigations reported in subsequent papers stem from their efforts in this direction. A new alkyl-aryl sulphonate (it would be more correct to say a new mixture of these) has been developed and tested, first on a small scale and finally on a very large scale. It was quickly established that the new surface active material (labelled JN, a symbol which is employed in the remainder of this article) had a considerably higher BOD than the old (labelled PT) and that, at the end of the BOD test, the amount of active material remaining was much smaller. It was decided to seek confirmation of its greater oxidizability thus indicated by treating it with sewage on small scale biological filters and activated sludge units. In

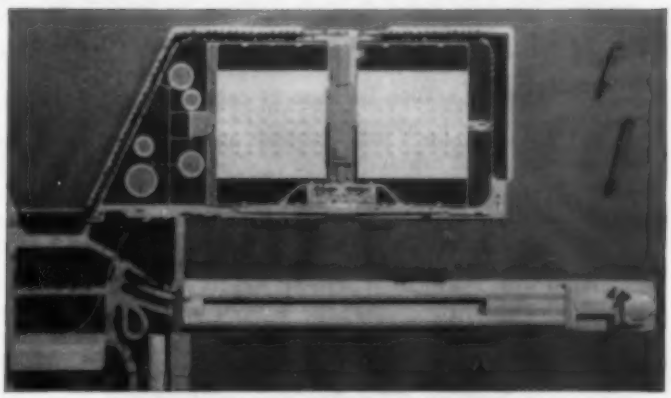
64 JEFFREY Chemical Mixing units at Chicago's new Central District Filtration Plant

Sixteen chemical mixing basins, equipped with 64 Jeffrey mixing units, will serve the "world's largest municipal water filtration plant" when it goes into operation in 1962. Each basin has a rated capacity of 60 million gallons per day, giving this plant a daily capacity of 960 mg.

Jeffrey equipment has seen years of service in other Chicago water and sewage treatment plants. It has proved its worth and dependability here, as well as in hundreds of other plants throughout the country—small plants as well as large.

Jeffrey's Sanitary Engineers offer help on problems involving plant layout and equipment. Bulletin 952 describes these services. The Jeffrey Manufacturing Company, 947 North Fourth Street, Columbus 16, Ohio.

Air view of the Central District Filtration Plant under construction.



A model showing what the plant will look like when completed.

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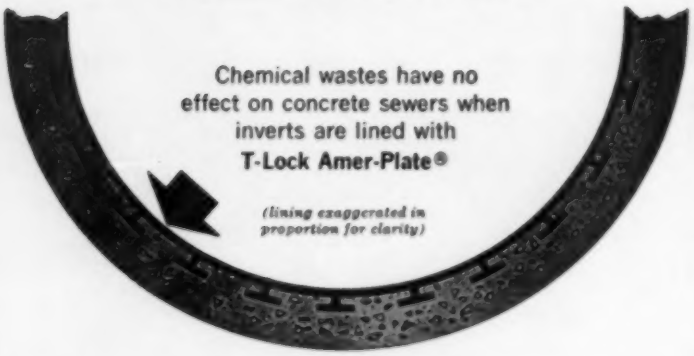
addition, the manufacturers made arrangements to have all the packeted synthetic detergents distributed to the Luton-Harpenden area be of the JN formula instead of the PT for a period of about a year. A complete changeover from PT to JN had not been accomplished after a period of 15 months or at the time of this report. However, it is felt in spite of the many difficulties the results of the Luton experiment has broadly confirmed that the JN type of detergent is more oxidizable than PT. More conclusive evidence of the type hoped for awaits the more complete replacement of PT in use in the area.

"The Problem of Synthetic Detergents." A Symposium on the results of the Luton experiment. By Arthur Key, D.Sc.,Ph.D., F. Inst. S.P., Senior Chemical Inspector, Ministry of Housing and Local Government. *Contractors Record and Municipal Engineering*, June 22, 1960.

A second paper which was given at this symposium is also of considerable interest. *"The Analytical Problems"*. A new method for the analysis of synthetic anionic detergents in sewage and sewage effluents is proposed. This may be carried out in any laboratory and which does not involve the use of expensive equipment. By H. L. Bolton, F.R.I.C., and P. J Cooper, B.Sc., A.R.I.C., Laboratory of the Government Chemist. *Contractors Record and Municipal Engineering*, June 22, 1960.

How to Protect Concrete Sewers from Chemical Wastes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(lining exaggerated in proportion for clarity)

T-Lock Amer-Plate is a high polymer PVC sheet, easily cast into pipes, tunnels and structures to form a partial or complete 360° protective lining. Used in inverts, it permanently protects concrete from corrosive chemical effluents. In arch areas, it positively stops oxidized H_2S corrosion. T-Lock is also highly abrasion resistant; impartial tests show that it abrades at only 1/70th the rate of concrete.

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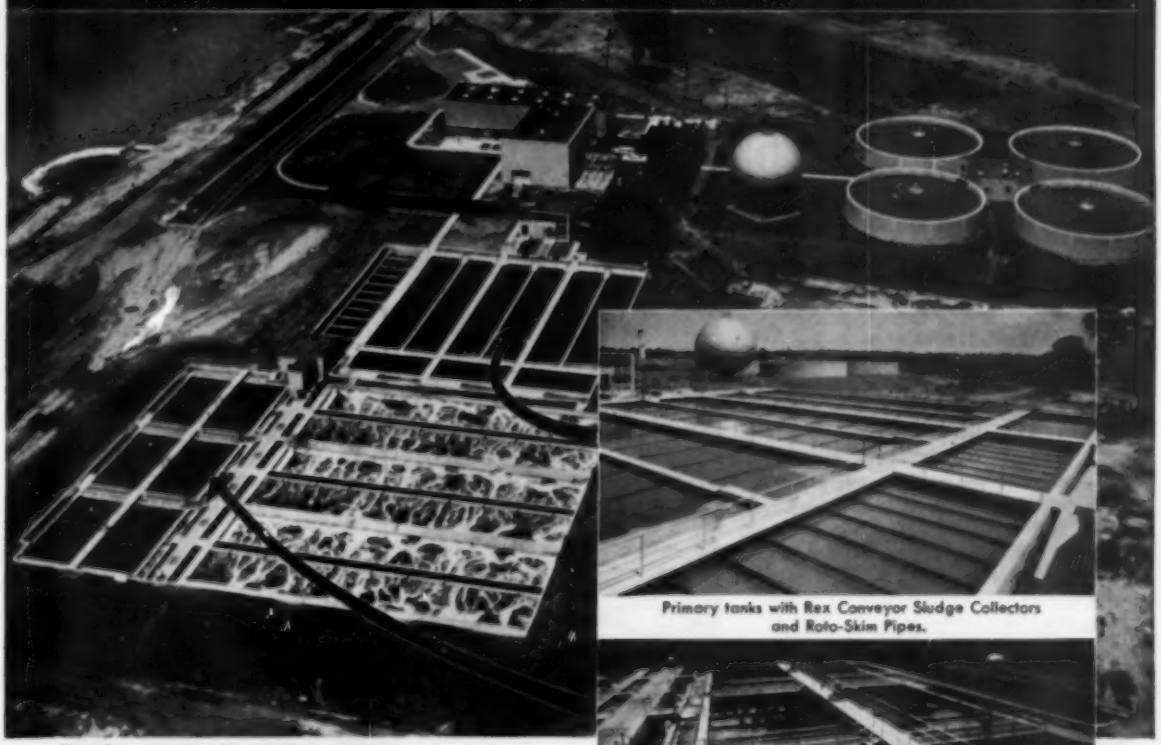
Sanitation Costs Cut 31 Percent

Fredericksburg, Va., has made a constant effort to reduce costs of its refuse collection and disposal operations. Its sanitation department expended almost $71,000 in the 1953-54 fiscal year. This year the department will cost only $49,000—a 31 percent decrease which has been achieved while increasing collection services and despite higher material costs, wage increases, the initiation of paid vacations and the replacement of open dumps with sanitary landfills. This reduction stems from cost-conscious supervision and the recent initiation of a unique refuse collection system which utilizes paper bags as garbage can liners. Several improvements in administration were made including: 1) Route revisions; 2) reducing absenteeism; 3) increasing flexibility; 4) minimizing equipment repairs; and 5) reducing complaints. By 1958, it seemed unlikely that any large additional economies could be realized while continuing the can exchange system. At that time a study of collection operations was conducted with the assistance of the Union Bag-Camp Paper Bag Corporation. The report resulting from this study highlighted the major defects of the can exchange system and recommended discontinuing the exchange and washing of garbage cans at each collection. It also recommended initiating the use of duplex paper bags as garbage can liners; closing the incinerator; disposing of all refuse by sanitary landfill; and replacing rack type collection trucks with modern packer units. Nearly a year of operating the new system has indicated the following: 1) Packer trucks have permitted more economical and efficient removal of garbage from residential areas; 2) the duplex paper bags have proved exceptionally durable; 3) a 75% reduction in the weight handled by collectors, and the use of packer trucks has permitted reducing the collection force by one man; 4) despite fewer collections and a correspondingly increased work load, a three-man crew averages over 500 rear-yard collections daily; 5) en-

MODERN AS TOMORROW



Plant Superintendent: Harold W. Augenstein
Consulting Engineers: Consoer, Townsend & Associates, Chicago

Primary tanks with Rex Conveyor Sludge Collectors and Roto-Skim Pipes.

Final tanks with Rex Unitube Tow-Bro Sludge Removers.

HAMILTON, OHIO, PLANT

Planned For Peak Performance

The Hamilton, Ohio, new split activated sludge sewage treatment plant is a tribute to sound planning that considered not only today's but tomorrow's requirements. In anticipation of a substantial population and industrial expansion, the planning team designed a plant that would provide maximum efficiency with adequate reserve capacity for future growth of the community.

The new plant has a designed average flow of 12 m.g.d., with a maximum designed flow of 18 m.g.d. handling both municipal and industrial wastes. In the design of the Hamilton plant, maximum utilization of available area was accomplished through a compact arrangement of the treatment units by using common wall construction throughout.

The grit chambers, equipped with Rex Chain and Bucket Grit Collectors, and the rectangular primary tanks, with Rex Conveyor Sludge Collectors and Roto-Skim Pipes, are neatly grouped with the rectangular aeration tanks and the three square final tanks. Future expansion of these units with a minimum of cost is guaranteed.

In the final tanks, Rex Unitube Tow-Bro Sludge Removers assure maximum flexibility in operation ... both today and for years to come. With more positive and general removal of sludge, the Tow-Bro provides ample facilities for efficient operation under varied conditions.

Rex Waste Treatment Engineers are available to help design and select equipment for modern plant performance as at the Hamilton, Ohio, plant. For complete information, write CHAIN Belt Company, 4722 W. Greenfield Ave., Milwaukee 1, Wisconsin.

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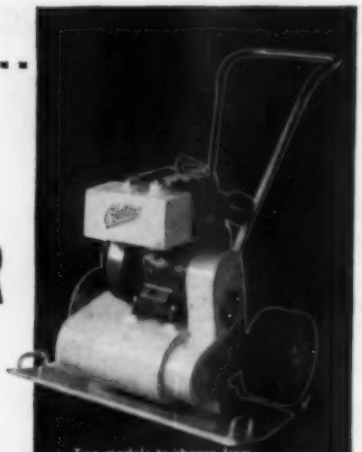

Two models to choose from: Model 36KT (above) with 30" or 36" wide shoe, and Model 18KT with 18" or 24" wide shoe.

Below, Model 18KT packing down sub-base materials on a road-widening job

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closed packer bodies have reduced street litter and their low loading heights have eliminated back injuries; 6) the use of packer trucks allows the department to operate with only two trucks, whereas three vehicles were formerly required; 7) closing the incinerator and the use of paper bags has permitted reducing the sanitation department personnel by 5 employees throughout the year.

"Sanitation Costs Cut 31%". By Clifford Rusch, Administrative Assistant, Fredericksburg, Va. PUBLIC WORKS, August, 1960.

Refuse Disposal Master Plan

Like most metropolitan areas, Orange County, Calif., is faced with the problem of an increasing demand for refuse disposal facilities. The general policy of the County now prevailing is as follows: 1) Facilities will serve the cities and unincorporated area with no charge for disposal; 2) material is limited to household and commercial trash and garbage, liquid and industrial wastes not being acceptable; 3) trash originating outside the County is not accepted; 4) salvage operations at disposal sites are prohibited. The County is not concerned with collection as the residents of the County are provided with a collection service. Thus, the fundamental concepts are local collection with disposal beyond the local haul by the County. There are now eight disposal sites, but only three of these can be considered long lived. Based on population estimates of 2 to 2.5 million by 1980, and an ultimate population of 3 million and a refuse production of 3 pounds per capita daily, provision for the eventual disposal of 4,500 tons per day is being made. The present landfill system costs about $1.25 per ton based on disposal of about 1,000 tons per day at seven scattered landfill sites. Estimates of costs of operating only 5 landfill sites thereby increasing the length of haul in about one-third of the City are provided, together with estimates of operating transfer stations making it feasible to use 22-ton capacity vehicles for the longer hauls, thereby reducing the cost. Computations based on various conditions and for the ultimate population make it appear that four transfer stations would provide the most economical overall condition.

"County Prepares a Master Plan for Refuse Disposal." This article is based on a "Master Plan for Refuse

Disposal" which was prepared for Orange County, Calif., and which was forwarded by A. S. Koch, County Surveyor and Road Commissioner. PUBLIC WORKS, August, 1960.

Other Articles

A Review of the Literature of 1959 on Wastewater and **Water Pollution Control.** This last of three sections of the Literature Review covers water pollution. By Research Committee, Water Pollution Control Federation. H. Heukelekian, Chairman. Journal Water Pollution Control Federation, July 1960.

"Water Quality Control Considerations in the **Red River Compact.**" I. Introduction. By Henry C. Beckman, U. S. Geological Survey, Rolla, Mo., Chairman, Red River Compact Commission. II. Quality Degradation of the Red River by Natural Sources. By H. M. Crane, Senior Sanitary Engineer, Oklahoma State Department of Health, Oklahoma City, Okla. III. Quality Degradation of the Red River by Man-Made Sources. By D. F. Smallhorst, Director, Division of Water Pollution Control, State Department of Health, Austin, Texas. IV. One Abatement Program and Water Quality of the Ouachita River—A Tributary of the Red River. By G. T. Kellogg, Chief Engineer and Director, Arkansas Bureau of Sanitary Engineering, Little Rock, Ark. V. The Downstream End. By John E. Trygg, Director, Division of Public Health Engineering, Louisiana State Board of Health, New Orleans, La. VI. Water Quality Control in a Water-Rich State. By K. E. Biglane, Executive Secretary, Louisiana Stream Control Commission, Baton Rouge, La. Journal of Water Pollution Control Federation, July 1960.

"The **Discharge of Effluents** into Inland and Tidal Waters." Coincident with the condemnation of the state of Britain's beaches by the B.M.A., and the subsequent public outcry against the discharge of effluents into the sea waters comes this defense of the practice. By Bertram F. Holden, M.I. Mun. E., A.M.I.C.E. Engineer and Surveyor, Hoylake U.D.C. Contractors Record and Municipal Engineering, June 29, 1960.

"Design of **Sewage Pumping** Stations." Basic considerations are discussed in this comprehensive article. By H. H. Benjes. Black & Veatch, Consulting Engineers, Kansas City, Mo. PUBLIC WORKS, August, 1960.

"A New Method for **Calculating K and L** for sewage." A new method which utilizes quite simple calculations and does not require any special charts or curves is presented. By Remo Navone, Chief, Branch Public Health Laboratory, Los Angeles, Calif., Water & Sewage Works, July, 1960.

"**Conditioning Sludge** With Aluminum Chlorohydrate for Vacuum Dewatering." Baltimore studies demonstrate most effective ways to produce more cake with elutriated digested sludge. By C. E. Keefer, Sewerage Engineer, Bureau of Sewers, Baltimore, Md. Wastes Engineering, July, 1960.

"Air from Central Compressor Plant For **Ejector Stations** in the Peninsula." How Coral Gables, Fla., serves detached population pockets. By John D. Buckley, Sanitary Engineer and George G. Mooney, Civil Engineer, Maurice H. Connell & Associates, Inc., Consulting Engineers. Wastes Engineering, July, 1960.

Testing Program for Sewage Pumping Stations

In Los Angeles, the Sewer Design Division in cooperation with the Sewer Maintenance Division of the Bureau of Sanitation, has set up a program for testing the 35 sewage pumping plants located in the city. The prime purpose is to test the efficiency of each pumping plant. This is accomplished by measuring the volume of sewage pumped within a given period of time, the amount of electrical energy consumed during the pumping period and the pressure or head at which the pumps operate. The program has been useful in design and also in determining the most efficient means of operation.

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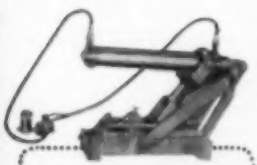

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ANDREW L. LEHRBAUMMER,

City Purchasing Agent,

Milwaukee, Wisconsin

WHILE the situation was not quite that serious, it did prompt President Juscelino Kubitschek of Brazil to dispatch urgently two men to Milwaukee to get four much needed valves at any cost. Let's start with the proper sequence of events.

At the time of the 600-mile removal of the capital of Brazil to the newly built Brazilia, a water system was designed and constructed for the area. However, when the system was placed in use, some valves failed immediately as they were not constructed for the unusual 250 pounds pressure which the lines contained. Although the original installations were not Allis-Chalmers valves, Sansao C. Pereira of Rio de Janeiro, the A-C distributor in Brazil and Lewis Fry of Sao Paulo, the factory representative of A-C International in Brazil were called in on the trouble. They contacted Frank R. Wozniak of Allis-Chalmers International in Milwaukee regarding their problem. He consulted with Charles L. Babb, Chief Engineer of the Centrifugal Pump Department of Allis-Chalmers, who, it developed, is blessed with a long and valuable memory.

He remembered that in 1931 the City of Milwaukee had laid a high pressure water system for fire fighting purposes in the downtown area of Milwaukee with 20-in. valves of 250 pounds design. The regular Milwaukee water system has a pressure of 130 pounds at the pumping stations decreasing throughout the distribution area. Coincidentally, Mr. Babb remembered that the City of Milwaukee had abandoned their high pressure system two years ago.

When this information was received, President Kubitschek immediately dispatched Messrs. Pereira and Fry to Milwaukee with orders to bring back two of these valves to Brazilia at any cost. Emergency manufacture of them locally would have taken at least one month, being a 20-in. class

H gate valve designed for 250 pounds pressure. As Mr. Pereira so aptly put it, "when the President of the country tells you to go—you go." Arriving in Milwaukee by air they met with Messrs. Wozniak and Babb who were the liaison for the acquisition of these much needed valves.

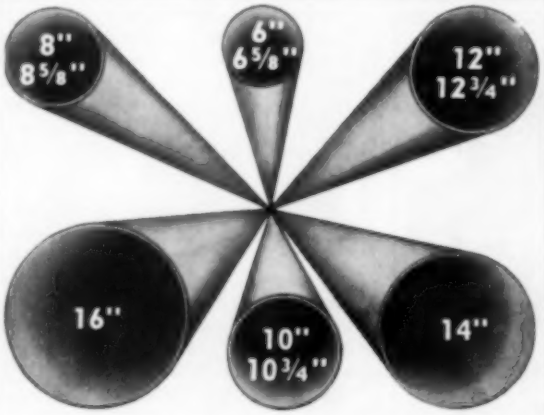
After the discontinuance of the high pressure system, the Fire Department declared the valves and other equipment to the Purchasing Department for disposal. The only alternative, it appeared, was to sell these for scrap as the Purchasing Department determined that the cost of removal would more than offset any receipts from the sale. So they remained attached to the system.

When the urgent need of the Brazilian Government was made known, Assistant Superintendent of the Water Department, Elmer Becker, arranged to have the system capped after removal of these valves. City Purchasing Agent, Andrew L. Lehrbaummer, placed a price of $50 each on the valves to be removed by Allis-Chalmers and flown by chartered plane to Brazilia.

The Shea - Matson Company, heavy equipment movers were employed by A-C to remove the valves. Two of them were trucked to New York immediately to load on the chartered plane with the other two valves to follow later. The City was glad to get $50 for each valve "where is"; the Allis-Chalmers Mfg. Company and their International Division were glad to live up to their name of giving unusual service; and Brazil was glad to get the much needed valves.

Weed Cutters Help Control Brush Fires

● **HAZARD of brush fires during the dry California summer is abated by work of the Los Angeles County Weed Control District No. 4, which uses two International T-340 crawler tractors equipped with three-point hitches to pull heavy disc harrows. The T-340's are used on a year-around basis to destroy weeds and brush that frequently present a fire hazard in the outlying residential areas of the county.**



NEW high frequency, resistance welded pipe

If you want a closer source for pipe that meets the highest standards of the industry, better talk to Valley. New resistance welding and process control facilities assure you of the quality you demand. Ideal as line pipe for gas, water, air conditioning ducts, etc. Special wrappings and coatings. Steel piling also available.

Sizes: 6" 6⅝" 8" 8⅝" 10" 10¾" 12" 12¾" 14" 16" in wall thicknesses to .219.

Write or call Steel Pipe Division

VALLEY MANUFACTURING COMPANY
VALLEY, NEBRASKA

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The WORLD'S MOST COMPLETE LINE of SNOW REMOVAL EQUIPMENT!

A Versatile year-round Maintenance Unit

- Wausau Snow Plows - Vee and Blade
- Wausau Snow Wings
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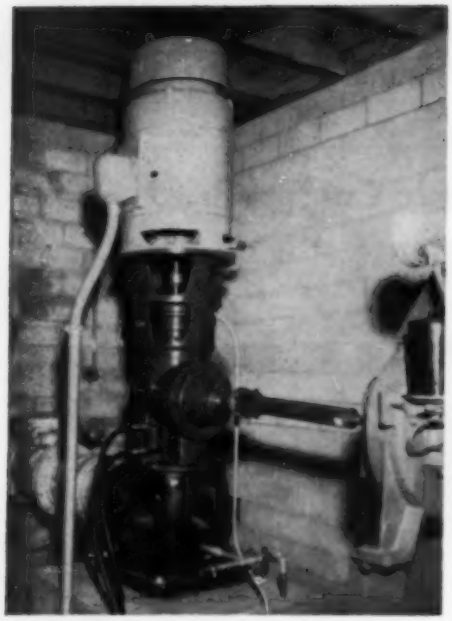
- Wausau Sno-Thro Loader and Thrower
- Wausau Material Spreaders
- Write for full details on all Wausau Products . . . Literature available on every item.

TRUCK GRADER — ICE BLADE

Maintains, cuts and grades all types of gravel and dirt roads, eliminates ruts, holes, and washboards. For winter operation it plows, breaks, and removes ice and hard-packed snow hazards . . . truly a versatile year 'round maintenance unit . . . full power hydraulic cab control.

WAUSAU IRON WORKS
Pioneer Snow Plow Builders
WAUSAU, WISCONSIN



NEW! Automatic combination gear drive

JOHNSON

Redi-Torq ®

Redi-Torq combination right angle gear drive with automatic clutch, eliminates manual switch-over to engine drive in case of power failure. Drive couples to engine by flexible shafting or couplings—engine clutch unnecessary. Engine may be tested without interfering with electric motor operation of pump.

For round-the-clock protection against power failure in water, sewage and fire installations. Developed and proven in municipal and industrial use over several years.

Sizes: 15 to 200 hp; hollow or solid shafts. Write for engineering catalogs.

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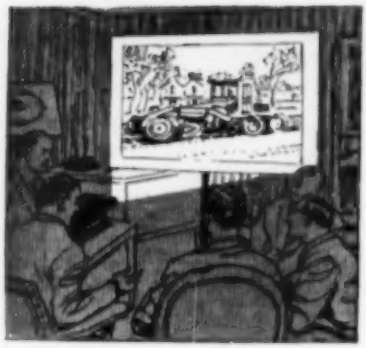

FILMS in Brief

Listed below are motion picture films of current interest to engineers, administrators and supervisors in the public works field. The companies providing these films have indicated that the films are available for appropriate use by PUBLIC WORKS readers. Requests for films should be made direct to the company listed with the film.

"The Builders." The story of man's struggle to build bigger, higher and better. Starting with such fundamentals as the arch, truss and lintel, it traces the development of building through the years. (31 min., color, sound, 16 mm.) Wire Reinforcement Institute, Inc., in care of Modern Talking Picture Service, Inc., 45 Rockefeller Plaza, New York 20, N. Y.

"Lime Stabilization of Roads." Lime's use in stabilizing marginal clayey soils on projects for highways and streets, showing typical construction procedures for subgrade and base courses. (23 min., color, sound, 16 mm.) National Lime Association, 925-15th Street, N.W., Washington 5, D. C.

"Flexibility Underground." The various theories concerning the construction of underground sewers and the durability of metal pipe used for this purpose. (25 min., color, sound.) Advertising Department, Attention E. E. Wilkinson, Armco Steel Corporation, 703 Curtis Street, Middletown, Ohio.

"Introduction to Highway Hydraulics." Illustrates basic hydraulic principles related to open-channel flow design in highway engineering. (21 min., color, sound, 16 mm.) Photographic Section, Attention R. B. Dame, Bureau of Public Roads, Washington 25, D. C.

"Water—From Plans to Plenty." Planning and work necessary to provide an always adequate water supply in the Indianapolis area. Covers reservoirs, purification plants, pumping stations, distribution mains, etc. (25½ min., color, sound, 16 mm.) Operations Center, Attention Mr. Kleinhenz, Indianapolis Water Company, 1220 Speedway Avenue, Indianapolis 7, Indiana.

"A Prime Move Forward." A report on the engineering and design features of the Oliver OC-9 and OC-96 crawler tractors, showing typical loading operations and stopwatch timing of the various cycles. (20 min., color, sound.) The Oliver Corporation, 400 West Madison Street, Chicago 6, Illinois.

"An American Landmark." Traces the engineering, fabrication and erection of a 1,500,000 gal. elevated water tank for the City of Wheaton, Illinois. (20 min., color, sound, 16 mm.) Chicago Bridge and Iron Company, Public Relations Department, 332 South Michigan Avenue, Chicago 4, Illinois.

"Pure and Simple." How water problems are solved by the installation of sewage and industrial waste treatment at chemical and industrial

plants. (Color, sound, 16 mm.) Public Relations Department, Link-Belt Company, Prudential Plaza, Chicago 1, Illinois.

"Modern High-Speed Rotary Snow Removal." (Color, sound, 16 mm.) Advertising Department, American Snowblast Corporation, 1237 Shoshone Street, Denver 4, Colorado.

"Lifetime Protection for Sewer Systems." The mechanism of corrosion in sewers and the methods of control. (30 min.) Amercoat Corporation, 4809 Firestone Boulevard, South Gate, California.

M/B Sweepers Work *Faster than Aspirin* for Relieving Snow Removal Headaches!

When snow is 6" to 10" in depth, the easiest, fastest, most economical method of removal is an M/B Sweeper. Leave big, expensive truck plows in the garage, for a low-cost tractor-sweeper combination easily cleans snow from streets, parking lots, airport runways, playgrounds, skating rinks, etc. There's an M/B Sweeper to fit most popular tractors or loaders—choice of two-way angling with hydraulic drive or low cost, fixed angle, mechanical drive. Solve the snow headache now—see your tractor dealer, or write the M/B Corporation, New Holstein, Wisconsin, Dept. Pw.

M-B CORPORATION
NEW HOLSTEIN, WIS.

SWEEPERS
LINE MARKERS
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Quality Equipment Since 1907

Now...*a 6 minute splice* for Rubber Waterstop

To splice Gates new Kwik-Seal Rubber Waterstop, all you need is a small splicing kit and simple clamping device. This eliminates the need for a field vulcanizer, molded parts, a power supply or heat.

The Gates Kwik-Seal splice is chemically bonded. The strength of the bond often exceeds the strength even of the rubber—far stronger than government requirements. *One man makes this strong, permanent splice in just 6 minutes—5 times faster than with former methods!*

As a result, this new Gates splicing method cuts your labor costs and speeds the job.

1

Apply Kwik-Kem bonding chemical to prepared surface.

2

Clamp Waterstop firmly for 5 to 6 minutes... and it's spliced.

WRITE FOR CATALOG and splicing demonstration.

The Gates Rubber Co. Sales Div., Inc.
Denver 17, Colorado

Gates Rubber of Canada Ltd.
Brantford, Ontario

SEE OUR CATALOG IN SWEET'S

TPA 977-A

Gates

Gates *Kwik-Seal* Waterstop

THE INDUSTRIAL WASTE DIGEST

Prepared by **CLAYTON H. BILLINGS,** *Associate Editor*

Streamlined Plating Waste Treatment

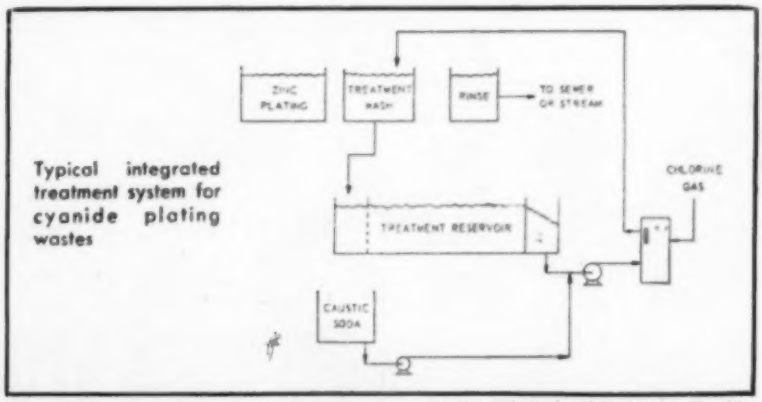
In plating processes, the work piece is immersed in the plating bath, and as it is removed some of the plating solution adheres. This is the source of cyanide and hexavalent chromium waste. The usual method of cyanide removal is by alkaline chlorination which effects complete oxidation to carbon dioxide and nitrogen. This is frequently done by batch treatment where one or more rinse tanks are provided plus two tanks for treatment which must be large enough to hold the entire rinse accumulation plus treatment chemicals, necessitating a sizeable investment in space and equipment. Fischer and Porter Co. has developed an integrated system of plating waste treatment which is based on treatment of the waste at the source. It is accomplished by treatment of the waste in the rinse tank. This tank is connected to a larger treatment solution reservoir which equalizes shock loadings, settles out precipitated hydroxides and provides holding time for the reaction. Instrumentation for control is not required because a large excess of treatment chemicals is used and paper and spot tests will suffice. Chlorine is added by pumping the supernatant from the reservoir through the ejector of the chlorinator. The chlorine feed rate is set at 300 to 500 ppm of available chlorine. Caustic addition is by a metering pump, manually set to maintain the pH level at 10 to 11. The actual requirement for caustic is a function of the relative concentrations of cyanide and caustic in the plating bath. The requirement is usually 1/3 to 1 lb. per lb. of chlorine. Since there is a build-up of sodium chloride and sodium carbonate in the treatment solution, every two to three months the solution should be discarded.

"Plating Waste Treatment—No Longer a Necessary Evil." By Lawrence A. Greenberg, Fischer & Porter Co. *Industrial and Engineering Chemistry*, August, 1960.

Sugar Cane Wastes

Three-quarters of the sugar cane production in the United States comes from 20 parishes of south central Louisiana. The rivers and bayous in this area drain large swamp areas and tend to carry natural high pollution loads, becoming septic in late summer and early fall, before the cane is harvested. Mechanical harvesting of cane, as is practiced here, involves the pickup of soil, trash and other foreign material, making preliminary washing of the cane imperative. The wash water re-use period is limited because of the presence of sugar decomposing organisms. In 1954 the sugar industry was cited as the chief source of water pollution in Louisiana. To study the problem, a group of eight mills organized the Louisiana Sugar Producers Waste Control Council and engaged in a cooperative project with the Chemical Engineering Department of Louisiana State University. Data on BOD, oxygen consumed and dissolved sugar were obtained on each mill effluent. The sources of pollution were isolated as condenser cooling water from the evaporator, cane wash water, sodium hydroxide and hydrochloric acid used in cleaning heat exchangers, filter cake and floor sweepings. It was discovered that sugar loss occurred from liquid entrainment in vapors, carried off by condenser cooling water. By installation of more efficient entrainment separators, the savings in two cases amounted to $2,500 per day. Proper housekeeping measures improved the waste contributions in floor sweepings. Filter cake was returned to the soil as fertilizer. Lagooning appeared to be the only solution for the cane wash water pollution problem.

"Pollution Abatement in the Sugar Industry of Louisiana." By Arthur G. Keller and H. K. Hucka-



Typical integrated treatment system for cyanide plating wastes

Courtesy Industrial and Engineering Chemistry

● **SPACE saving idea for treatment—channel the rinse through the chlorinator.**

BE A GOOD NEIGHBOR

to the folks downstream!

Dumping raw and inadequately treated sewage or industrial wastes into waters which are downstream communities' source of water supply is of necessity nearing an end. Anticipate now their demands for protection from your sewage and wastes by building trickling filters.

Johnson Motors photo

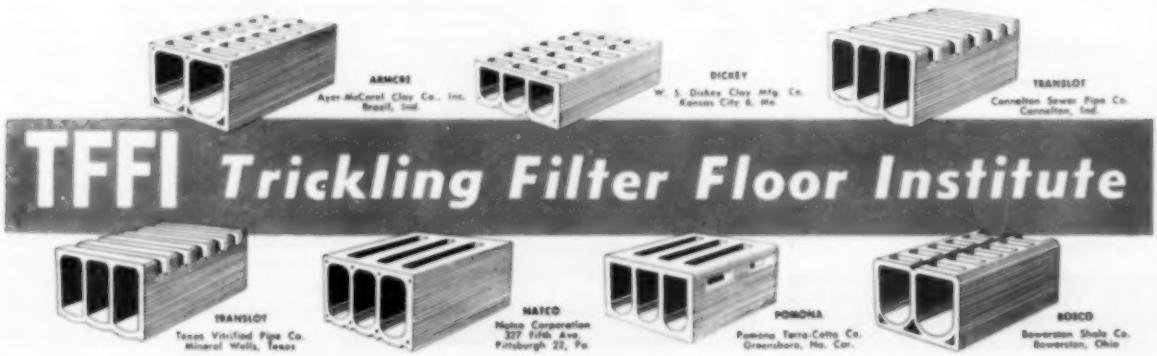
THE VITAL PART OF TRICKLING FILTERS

The most vital part of these trickling filters is their underdrain system. Failures here spell big trouble later. But when the floor is of TFFI Specification vitrified clay blocks this is guarded against. It is inherent in clay to resist successfully the ravages of acids, alkalis, and bacteriological action. TFFI blocks are made in modern plants under rigid controls of quality that no substitute material can even approach. (Only with them can you get a 50-Year Guarantee.)

Demand Certified Underdrain Block

Vitrified Clay Block manufactured by TRICKLING FILTER FLOOR INSTITUTE members and tested by the Materials Testing Laboratory of Rose Polytechnic Institute comply with or exceed ASTM Specification C 159-59T.
Copies of this Specification are in the new TFFI Trickling Filter Floor Handbook. Ask any member of our Institute for your copy if you lack one.

Imhoff tank at Somerset, Pa., filter



IF YOU CUT LARGE DIAMETER PIPE...
YOU NEED THESE
New REED HINGED 4-WHEEL PIPE CUTTERS
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.

Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

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BUILD BETTER SEWER LINES

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(a cement joint)

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AT LAST a practical remote indicator and recording system. Tested and approved. Now used by 77 cities. ViSi-Meter eliminates city expense and liability of controlling keys to customers' residences. Easily read in one trip by meter readers.

Customers like ViSi-Meter because no one need enter the home to read the meter.

THIS PRODUCT IS MANUFACTURED AND GUARANTEED BY
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301 NORTH 17th STREET KANSAS CITY, KANSAS

bay, Louisiana State University. *Journal Water Pollution Control Federation*, July, 1960.

Auto Smog Catalytic Mufflers

The hydrocarbons in the exhaust of automobiles are considered to contribute heavily to the air pollution problem of eye-irritating smog in urban areas. Catalytic oxidation, applied at the sources of the exhaust, the individual vehicles, appears to be a logical solution. A large number of granular metal oxides have been evaluated for suitability for use in a catalytic muffler. A group of eight representative hydrocarbons was selected for study: *n*-pentane, 2-methylpentane, 2-pentene, 1-pentyne, *n*-hexane, cyclohexane, 2,3-dimethylbutane and benzene. The microcatalytic-chromatographic technique was used for evaluation, the extent of oxidation at various temperatures being measured. In analyzing results, comparison was made on the basis of 80 percent decomposition of the hydrocarbons. This was done graphically with the temperatures required for 80 percent reaction for two hydrocarbons plotted against each other. Of the oxide catalysts tested, the following exhibited effective properties: cobalt, nickel, manganese, chromium and iron. Cobalt showed outstanding activity, with 80 percent decomposition occurring at around 200°C in most instances.

"Catalytic Oxidation of Hydrocarbons." By K. C. Stein, J. J. Feenan, G. P. Thompson, J. F. Schultz, L. J. E. Hofer and R. B. Anderson, Bureau of Mines, Pittsburgh, Pa. *Industrial and Engineering Chemistry*, August, 1960

Sampling Sulfuric Acid Mist

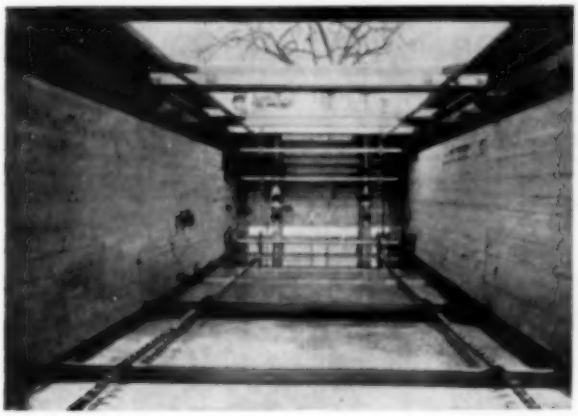
The electrostatic precipitator, Greenburg-Smith impinger and the sintered glass filter have been used in chemical analysis but no evaluation has been made of their relative abilities to collect sulfuric acid mist in the low concentrations found in polluted air. A study was made to determine the reproducibility of results from sampling by the three methods, using a homogenous steady state mixture of sulfuric acid mist and sulfur dioxide artificially induced. It was found that results were satisfactory over a concentration range of 0.5 to 150 mg. of sulfuric acid mist per cubic meter in an atmosphere where the sulfur dioxide concentration was as much as 200

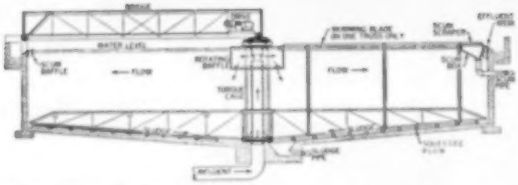
WHICH SLUDGE COLLECTOR

can do the best job for you?

For maximum efficiency . . .
minimum disturbance of flow . . .
choose LINK-BELT
STRAIGHTLINE sludge collectors

For large installations
where construction economies
are vital . . . it's LINK-BELT
CIRCULINE sludge collectors





STRAIGHTLINE COLLECTORS are scraper conveyors made in various styles to handle sludge and scum in *rectangular tanks*. Straightline design means the shortest possible travel for the collected material. It also permits a steady slow speed of the collecting flights that is uniform over the entire floor surface of the tank. This results in maximum efficiency with minimum disturbance to the flow. Straightline collectors can also be installed in the Link-Belt Uniflow settling tank—an improved rectangular design combining a rapidly sloping bottom with a system of multiple effluent weirs. **Write for catalog** number 2746.

CIRCULINE COLLECTORS are installed in either rectangular or round tanks. Link-Belt offers four series—R, S, T and C. Series R are usually installed in circular tanks and are used to remove settled sludge from the tank floor and scum from surface of liquid. Series S are for square tanks, or rectangular tanks where sludge is collected only from the influent end of tank. Series T are similar to Series R, except they are built to withstand torques encountered in removing heavy settled solids. Series C have both the economical feature of circular tank construction and the positive sludge and scum collection of a straightline sludge collector. Write for catalog number 2546.

Sludge collectors are only a part of the broad line of Link-Belt sanitary engineering equipment. Get in touch with the Link-Belt office nearest you. Our sanitary engineers will be glad to work with your engineers, chemists and consultants . . . help you get the finest in modern treatment methods. Or write for Water, Sewage and Industrial Waste Treatment Equipment Book 2617 and Uniflow Settling Tank Folder 2648.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

15,000

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. Sanitary Engineering Regional Offices—Colmar, Pa., Chicago 9, Kansas City 8, Mo., San Francisco 24. Sales Offices in All Principal Cities. Export Office, New York 7. Representatives Throughout the World.

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times that of the acid mist. However, this required special precautions with the impinger and electrostatic precipitator. The study established the ability of these instruments to make such sample collections in the atmosphere under field conditions.

"Collection of Sulfuric Acid Mist in the Presence of a Higher Sulfur Dioxide Background." By J. V. Kerrigan and Karel Snajberk, Sanitary Engineering Research Laboratory, University of California and Edwin S. Anderson, Stauffer Chemical Co. *Analytical Chemistry*, August, 1960.

Nuclear Reactor Wastes

It is desirable that those operating nuclear reactors make plans for emergency procedures to be taken to minimize possible harm to the public and plant personnel in the event of accidental release of radioactive material. Immediate evaluation of the problem in terms of the hazard to downstream users should not be a substitute for radiation monitoring or thorough field studies, but it can be an adjunct to help determine the future course of monitoring. In general the following should be considered in making an emergency evaluation of the problem:

1. Conditions of the release, which should be based on safe-guards reports, on monitored estimates of the quantity of radiation released (from an effluent stream monitor and alarm system), and on reports of operating personnel;

2. Time of flow to downstream water intakes, which can be estimated from hydrologic data obtained from rating curves of nearby dams, if applicable, or other sources;

3. Effect of radioactive decay, which can be estimated for the various flow times to downstream points by using a curve showing the relationship between time and gross decay factor (the ratio of initial radioactivity to activity at any time);

4. Effect of dilution, which must be assumed unless rates of diffusion are known;

5. Emergency limits, which should be established as relating to the actual biological hazard and should consider the duration of the hazard and potential radioactivity.

"Accident Preparedness in Reactor Waste Treatment." By E. D. Harward, Public Health Service. *Journal of the Sanitary Engineering Division, Proceedings of the American Society of Civil Engineers*, July, 1960.

• • •

New York City has 4.79-inch Rain

A heavy rainfall, resulting from tropical storm Brenda, dumped 4.79 inches of rain on New York City in about 10 hours on July 30. Out in Ridgewood, N.J., your Editor's rain gauge showed 3.4 inches total in a period of about 8 hours.

• • •

Other Heavy Rainfalls

The newspapers of June 25 reported a rainfall of 7.14 inches in Houston, Tex., during no more than a 24-hour period, and probably in less. More than 17 inches fell between the night of June 23 and June 26. During the same period 27.31 inches fell at Port Lavaca. A rainfall in Louisville, Ky., on June 23, amounted to 5.14 inches in 9 hours. An enterprising newspaper man figured that this rainfall, if evenly deposited on all 58.2 square miles of Louisville, would have amounted to 5,196,655,259½ gallons or 21,682,247 tons of water, which is a lot of weight and also a lot of water.

THE LELY FERTILIZER DISTRIBUTOR AND SEEDER

An outstanding success for the maintenance of turf as in parks, playgrounds, highway roadsides, golf courses, airports and other seeded areas.

Two types to choose from:

- 3 point hitch machine (as shown)
- Pull type wheel driven machine

Check the following features:

- High quality machine
- Spreading width up to 50 ft.
- Spreading angle can be varied from rear spreading to side delivery (important on highway roadsides).
- Very easy to clean as hopper can be detached by quick release
- High accuracy of fertilizer distribution
- Big hopper capacity and a spreading disk of special design

LELY

Stock of machines available in the United States and Canada. Write today for complete information to Ltd.

2113 Paisley Ave., Burlington (Ontario), Canada (Distributors and Dealers: Some territories are still available)

NEW MINIATURIZED WILKINSON LINE LOCATOR

MODEL W-3

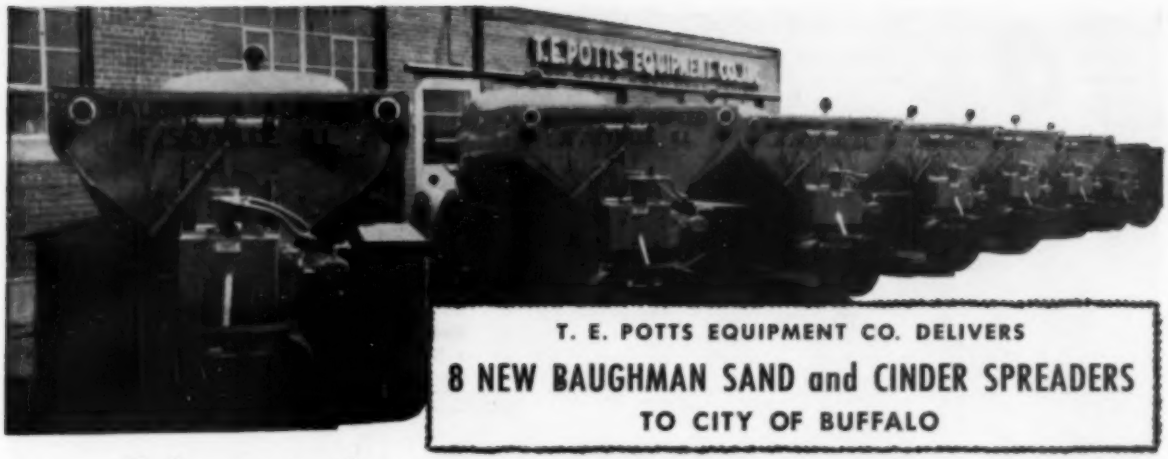
Radically new, powerful, transistorized locating instrument weighs only 4 lbs. and is ¼ as large as old type pipe locators.

Telescoping aluminum handle: 2 oz. single ear set: all in carrying case.

Write today for brochure and instruction manual.

WILKINSON PRODUCTS COMPANY

3987 Chevy Chase Dr., Pasadena 3, Calif. SYlvan 0-4314



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8 NEW BAUGHMAN SAND and CINDER SPREADERS TO CITY OF BUFFALO

Before you specify, consider how operating efficiency will be increased and long-life low cost performance assured, with these important Baughman ice control features:

LUBE-IMPREGNATED CHAIN DISCHARGE . . . a Baughman exclusive, positively insures greater corrosion resistance and virtually eliminates chain freezing.
TOUGHEST CHAIN DISCHARGE of any ice control body . . . total test strength of 40,000 lbs.
STRONGEST BODY MADE . . . with reinforced top edge, extended side jacks and internal bracing for full body support.
FEWER WORKING PARTS . . . less maintenance, yet positive spreading with even, quick, safe discharge.

WRITE TODAY for illustrated Bulletin A-408-B.

Better Service Through Better Engineering.
Service and Parts from 200 Service Branches.

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BAUGHMAN MANUFACTURING CO.

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Neenah Foundry Company Home Office and Plant No. 1

Neenah Foundry Company Plant No. 2, in production now

Neenah Announces...

. . . . the full-time operation of plant No. 2 — formally opened May 1. The production from this 150,000 square feet facility increases our daily maximum capacity to 500 tons of Gray Iron and Ductile Iron CONSTRUCTION CASTINGS.

Informative and fully illustrated 168-page catalog will be sent promptly upon request.

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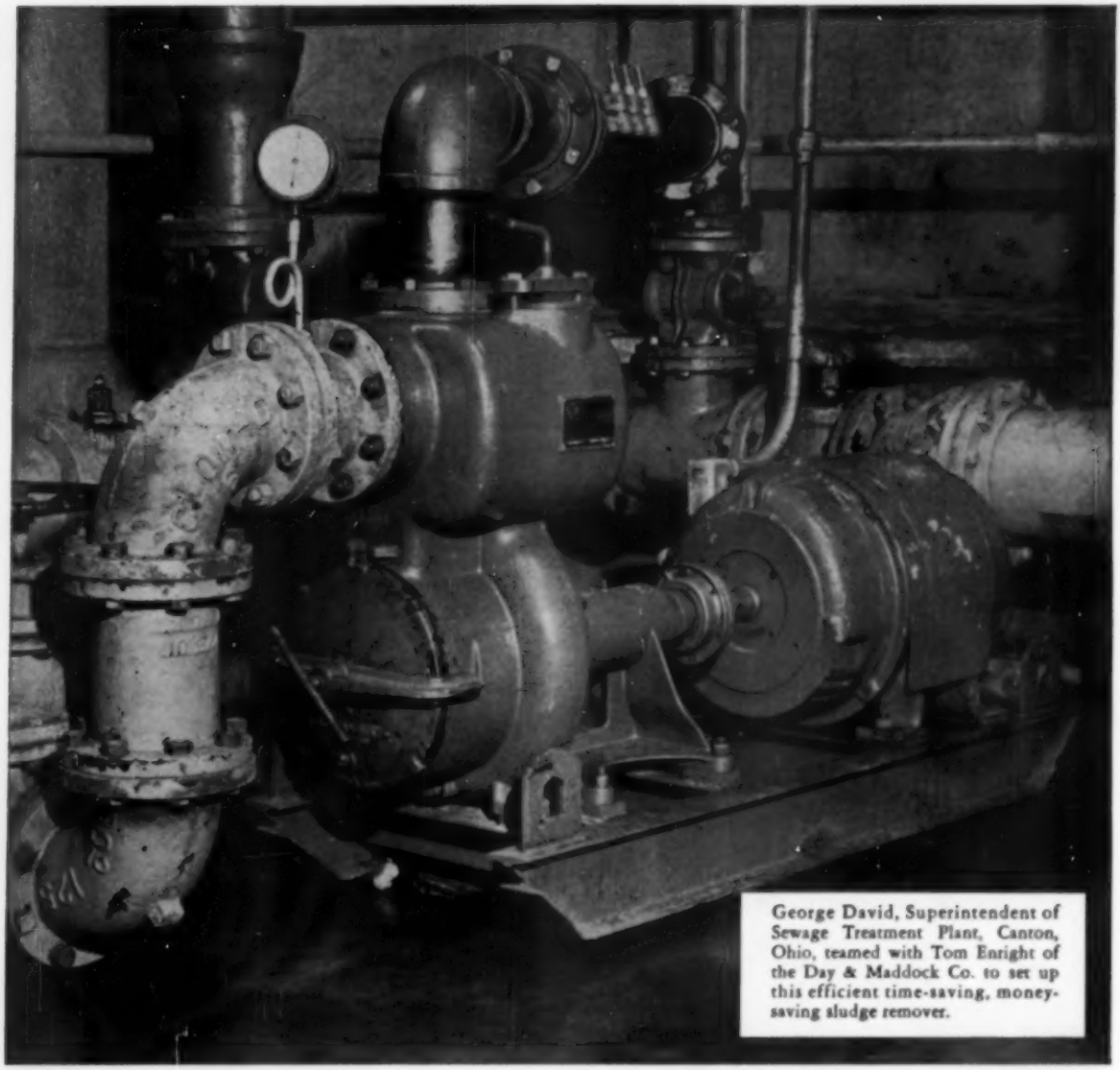
NEENAH FOUNDRY COMPANY • NEENAH • WISCONSIN

Chicago Office 5445 North Neva Avenue, Chicago 31, Illinois



George David, Superintendent of Sewage Treatment Plant, Canton, Ohio, teamed with Tom Enright of the Day & Maddock Co. to set up this efficient time-saving, money-saving sludge remover.

RECIRCULATION AND CLEANING PUMP SOLVES CANTON DIGESTER PROBLEM Gorman-Rupp Sewage Pump cleans with no downtime and major savings

Problem—To remove 7-years' accumulation of sludge from 10 huge digesters. With mechanical shoveling devices, it cost $5000 to clean only one digester. And during cleaning, digester was totally inoperative for 6 weeks.

Answer—A Gorman-Rupp Model 16A2-B Pump. Its unique action first agitates sludge into a common mixture by circulating digester liquid under pressure. Then, with valves reversed, pump draws off liquid and suspended solids for disposal.

Result—Each digester could be cleaned in only 21 days. Only outlay is cost of 6″ pump, electric motor, and labor of opening and closing 2 valves twice a day.

4″ and 6″ pumps can be connected to your power or ordered complete with power units. Write for complete specifications.

Fast-Action End Plate. Releases for access to impeller and renewable wear plate. Impeller is 2-vane trash type that handles spherical solids up to 2½″ in diameter.

THE GORMAN-RUPP COMPANY
305 Bowman Street • Mansfield, Ohio
GORMAN-RUPP OF CANADA, LTD.
St. Thomas, Ontario

Ramp Lighting For Night Safety At Interchange

Lighting of ramps is helping to make night driving safer on the heavily-traveled Greenbrae interchange in Marin County, California. Located at the junction of state highway 17 and US 101 about five miles north of the Golden Gate bridge, the interchange feeds traffic towards San Francisco and the Richmond-San Rafael bridge.

Ramps are among those dangerous areas that need lighting, according to highway engineers. "This is true," says J. C. Womack, Chief Engineer of the State Division of Highways, "for several reasons. Heavy traffic and the absence of shoulder refuge areas are perhaps the most important. Drivers must be able to see slow moving or disabled vehicles well ahead of time. Pedestrian walkways on the ramps also make lighting a necessity in certain instances."

The Greenbrae ramp lighting is integrated with a stretch of lighting on highway 101, made necessary by an unrelated entrance and exit about 800 ft. from the interchange. Average maintained illumination is calculated to be about 0.9 footcandle, which is above the recommended IES standards for roadway lighting. The units are mounted at a height of 30 feet and normal spacing is 165 feet. In critical merging areas, the General Electric 400-watt mercury vapor luminaires are placed closer together for higher lighting intensity. The luminaires are equipped with State Division of Highways approved shields for added protection against the possibility of motorists experiencing glare as they negotiate the curves and straightaways of the area.

Education in Noxious Weed Control

Hennepin County, Minn., last year carried on an educational program by meetings with 4-H clubs, farm bureaus, garden clubs and flower clubs to explain the uses and abuses of chemicals for weed control. There has been damage to crops, shrubbery and livestock by private spray operations, and some even by village and city crews. There are about 150 power sprayers in the County, each of which is capable of doing extensive damage if the operator is ignorant or even careless for a few minutes. The County controlled 1,872 acres of weed infestation with chemicals, using 5,700 gallons of 2,4D and 2, 4D, 5T, as well as some 12 tons of other chemicals.

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Laboratory and field tests show the need for Banox in salt used for snow and ice control to protect against corrosion damage by salt brine. Steel strips, such as the ones above, demonstrate what occurs to bare auto body steel on exposure to test solutions of de-icing salt, with and without Banox.

Rock salt is the effective and inexpensive way to control snow and ice on streets and highways. But salt-slush clings to bridges, ramps, salt-spreading equipment and, more important, motor vehicle underbodies, and the resultant corrosion damage adds up to many times the cost of protection with Banox.

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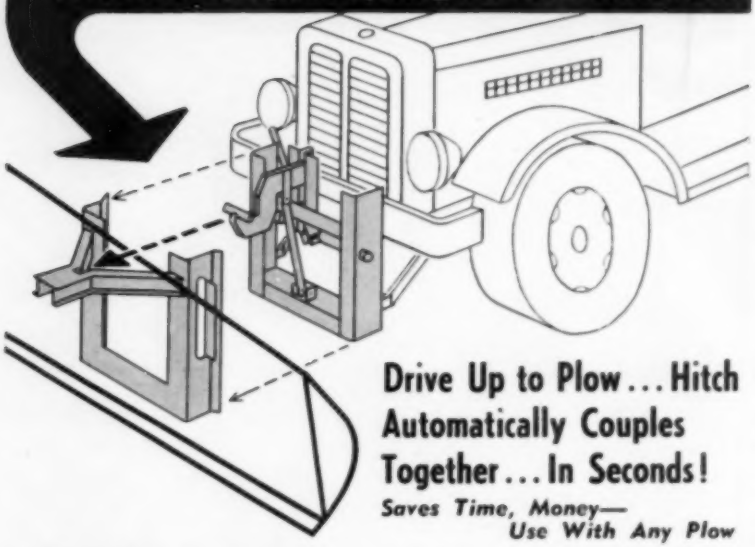

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A newly developed FLEXIBLE LINK (Pat. Pend.) gives HUSTING HITCH equipped plows additional freedom to follow the contour of difficult roadbed conditions found at some intersections and in alleys. It permits the snow plow to rotate about a central axis. Springs are used to hold the plow level in the carry position and prevent it from going out of control when in action next to a ditch.

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Water and Sewerage School

(*Continued from page 118*)

drawn from a rotating pool of personnel from consulting engineers, the state division of health, the water pollution board, sales representatives, equipment service men and waterworks and sewerage personnel. All serve without remuneration. The school and its facilities may be used in no manner for advertising, sales advancement or sales demonstration. Entertainment during school sessions is prohibited. Donated or loaned equipment and supplies are accepted and instructors are obtained only after these provisions are fully understood by all.

After several sessions of the schools, during which over 150 students received instruction, a summer recess had to be declared to give time to cope with the problems which came about through growth which exceeded all expectations. Tentative plans call for new sessions, starting again this September and continuing at the rate of about 20 per year, alternating the waterworks and the sewerage schools. A backlog of waiting applicants is now on record. Because of space limitations and the desire to keep classes small, the maximum accepted for each school was 25. However, consideration is now being given to limiting the classes to provide more individual instruction; but the school is not without plans for larger quarters if needed.

The week-long courses provide 40 hours of instruction per course. The registration fee is now a nominal $10 per student for each course. Food and lodging accommodations are numerous, satisfactory and economical, keeping the total cost of the week of training within the means of every community. Obviously, the $10 fee cannot support the school. Recent plans call for a budget which will permit a much expanded program to become effective. To date, starting expenses were met from the limited funds of the Missouri Water and Sewerage Conference, along with cash donations from many conference members, suppliers, engineering firms and others. Permanent financing is to be established in the form of pledges from interested groups. The school has been registered with the Internal Revenue Bureau and contributions are deductible for income tax.

So far, only basic waterworks and sewage courses have been presented. This policy will continue until this need is, at least, partly satisfied.

Thereafter, advanced training courses will also be offered.

Presently, students who qualify (necessary experience) can take the examination for "D" (lowest grade) operator license at the completion of each course. Future plans include provision for advanced grade license examinations.

The school now augments the annual short course given at the University of Missouri between semesters. There, lecture instruction is of a very high order but laboratory facilities and instruction are necessarily limited because of the one-session-a-year feature; and, of course, a mechanical laboratory for practical experience is obviously not feasible. Many communities find it difficult to arrange this one week into their schedule and a small system that can spare only one man at a time may require several years for the entire group to receive training.

The Missouri Water and Sewerage Conference has also sponsored one-day-a-month regional schools about the State and these are valuable to those places whose personnel cannot be spared for as much as a week at a time.

The Neosho School is governed by a school board, working with the director. This board will act much as the board of any other educational institution. There will also be an advisory board, made up of several interested men who are specialists in fields whose knowledge would be of great benefit.

A descriptive brochure will soon be available and any inquiries can now be addressed to Lloyd Caughran, Director, Missouri Water and Sewerage Technical School, Post Office Box 348, Neosho, Missouri.

• • •

Street Control During Building Programs

(*Continued from page* 113)

flict is anticipated between work on the building and traffic flow. As regards city projects for utility or building construction a section in the plans and specifications is included which details the means by which the contractor shall maintain normal flow of traffic during the construction phases. Some of the topics are: Dual Use of Streets, Street Construction and Maintenance, Minimizing Traffic Interference, Public Relations, Police Assistance, Street Excavation Regulations, Hours of the Day, Weekend Work, etc. (*Turn to page* 190)

machine: in June 1959 we purchased a Vermeer Pow-R-Stump Cutter.

Stump Removal

. . . wins public good will and adds beauty to Appleton, Wis.

By EDWIN DUSZYNSKI*
Director of Public Works

Appleton, with a population of about 48,000, instituted a stump-removal program strictly as a public relations activity. During the first four months of operation, July through October 1958, we learned two things. First, if handled properly, this business of removing stumps can be accomplished quickly, satisfactorily and economically. Secondly, the results in public good will and better-appearing streets is well worth the small cost involved. Other benefits add to the program's value.

For many years the Public Works Department did offer some assistance to property owners faced with the problem of removing stumps along the parkway or boulevard strip between the street curb and sidewalk. This consisted of lifting out the stump and hauling it away after the property owner had excavated around and under the stump and cut enough of the roots for easy removal. We made no charge for this service.

Over the years many trees in the parkway had been cut down for various reasons. In most cases a chain saw had been used, with the cut made as close to the ground as possible. Only a few people undertook the task of digging out the remaining stump. Others resorted to whittling away at the stump with an axe, burning it from the top down, or drilling holes in the stump and applying chemicals to accelerate disintegration. Seldom did these methods result in a satisfactory job, and in most cases the stump was left intact to mar the appearance of the parkway.

Aldermen Investigate

In view of the interest of abutting property owners in improving the parkway strip, which is part of the street right-of-way, several aldermen felt that the city should take some action. The expenditure of city funds was justified in that the work would be on city property.

Research revealed that others had tried many types of stump removal equipment but a Vermeer stump cutter showed the most promise. On a trial basis we hired two retired city employees of an adjacent city who owned such a machine and were engaged in the stump-removal business. These men went to work on several troublesome stumps while several aldermen watched the operation. At the next budget time, these aldermen provided the impetus to include [illegible] machine: in June 1959 we purchased a Vermeer Pow-R-Stump Cutter.

The method of cutting a stump ten inches below the level upon which the tires rest. A larger machine is available that will cut 18 inches below grade. With either machine the cut below actual grade can be extended by excavating around the stump to permit the machine's wheels to be placed at a lower elevation.

The unit, mounted on two pneumatic tires, consists primarily of an air-cooled gasoline engine supplying power to operate a cutting wheel and hydraulic pump. The pump provides pressure for hydraulic movement of the cutting wheel either horizontally or vertically.

We use a Willys Jeep to tow

* Mr. Duszynski has served as Director of Public Works for the City of Appleton since 1954 and prior to that held the same position in Cudahy, Wis.

Thanks, Mr. Duszynski!

Mr. Edwin Duszynski, Director of Public Works in Appleton, Wisconsin, tells of his experience with the Vermeer Pow-R-Stump Cutter in the above article from the June issue of American City Magazine. "The most economical method of stump removal I know of," is the way he describes the action of the powerful model 10 Pow-R-Stump Cutter. This is just one of hundreds of outstanding recommendations received each year from cities, parks, golf courses, cemeteries and tree service firms all over the country.

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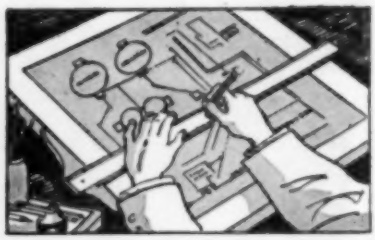

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Street Control

(*Continued from page* 187)

The City of Nashville is a member of the Southern Building Code Congress. The Southern Building Code is used by approximately eight hundred cities in the South and East. Each application for use of public property is handled on an individual basis, but the application of Chapter 21 of the Southern Building Code is used as a rule of thumb, according to J. Douglas Roach, Chief Building Inspector, and for all practical purposes as a maximum. Often it is necessary to reduce somewhat those requirements outlined in the Code. Before any barricade is erected, the Chief Building Inspector; the Inspector of the Police Department, who handles the traffic officers; the Superintendent of Construction; and the City Traffic Engineer usually denote what can be done and the amount of space that can be used in any specific case.

The temporary use of streets or public property in Nashville for the storage or handling of materials or of equipment required for construction or demolition, and the protection provided to the public is in accordance with the following:

(a) One third (1/3) of the width of street that is adjacent to the curb in front of the building being erected and for which a permit has been issued may be used. If the street in front of property adjoining such building is to be used for similarly limited storage, a due waiver of claim against the City for damages on account of such use, issued by the owner of such property, is filed with the Chief Building Inspector before such use is allowed.

(b) The provisions under which the street or sidewalk space may be used is limited in the following cases: 1) That the space allocated or any portion thereof shall not come within five (5) feet of a rail or railway track; 2) that a walkway be constructed in the outer portion of the permissible occupied street space; 3) that no building material, fence, shed, or any obstruction of any kind shall be placed so as to obstruct free approach to any fire hydrant, lamp post, manhole, fire alarm box, or catch basin, or so as to interfere with the passage of water in the gutter. Protection against damage shall be provided to such utility fixtures during the progress of the work, but sight of them shall not be obstructed: 4) that a ten (10) foot roadway be maintained through any alley located along the building site; 5) that proper precaution shall be made during con-

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struction to prevent concrete, mortar washings, or any other material from entering a sewer; 6) in erection or demolition of any building exceeding one (1) story in height that is located at a distance less than ten feet or less than one-quarter (¼) of the height of the building from any street, or alley property line, or when required by the Chief Building Inspector, a roof covering for the entire length of the project shall be provided over the temporary or permanent sidewalk, from the time the construction or demolition extends above the second floor level until materials are no longer being used or handled on the front above such walk.

Buildings in Nashville having their exteriors altered or repaired in an extensive manner involving any hazards shall be provided with a covered walk as required for new structures during erection. Where, in the opinion of the Chief Building Inspector, a covered walk is not necessary, a permit may be issued to block off part of the sidewalk and have a temporary walk constructed. All fences, barriers, or temporary structures of any kind located on public streets, shall be so constructed as not to obstruct vision with intersections of the street. Walkways must not be less than four feet wide in the clear except that in the congested districts the building inspector may require a walkway as wide as is necessary in his opinion. A smooth handrail of substantial construction, not less than three feet high, must be provided on the traffic or street side when required by the Chief Building Inspector.

The owner or his agent, the contractor, upon completion of the building, must immediately remove all walkways, debris, or any other obstructions, and leave such public property in as good a condition as it was before such work was commenced. During the course of construction in Nashville, every walkway must be kept well-lighted continuously between sunset and sunrise and the outer edge of the occupied space of the street or sidewalk shall have placed thereon red lights which shall burn continuously between sunset and sunrise.

Thus, most of the large metropolitan cities throughout the country have some sort of program to control the regulation of construction activity so as not to interfere with the normal routine of traffic flow. Some of the programs for control are more detailed than others—some follow a program to meet a current need while others are standard.

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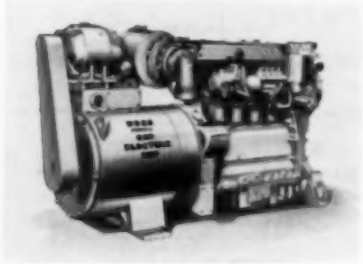

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Industrial Engine Plant, Caterpillar Tractor Company, Peoria, Illinois.

Circle No. **9-1** on the convenient reply card facing page 34.

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Machine offers an hydraulic-powered rotary head. Tubes and bits designed to minimize power loss by friction.

permits the use of auger or probe-type tools on the same head. A reclining mount lays the machine flat on a pick-up truck bed. Coring to a depth of 10 ft. in 60 sec., with rotating type augers or tubes, it cuts through gravel, loose rock and sandstone to depths of 20 ft. or more. It is attached to any truck or tractor with power takeoff. There are four types of mountings: rear-tail mount, side mount, rear-tractor mount, rear-well mount.

Giddings Machine Company, 401 Pine Street, Fort Collins, Colorado.

Circle No. **9-2** on the convenient reply card facing page 34.

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Cripe Tool Manufacturing Corporation, P. O. Box #61, Owosso, Michigan.

Circle No. **9-3** on the convenient reply card facing page 34.

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Can dig up to 5½′ by 8″ or 4′ by 12″.

Arps Corporation, New Holstein, Wisconsin.

Circle No. **9-4** on the convenient reply card facing page 34.

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Bucyrus-Erie Co., South Milwaukee, Wisc.

Circle No. **9-6** on the convenient reply card facing page 34.

Remote Registry

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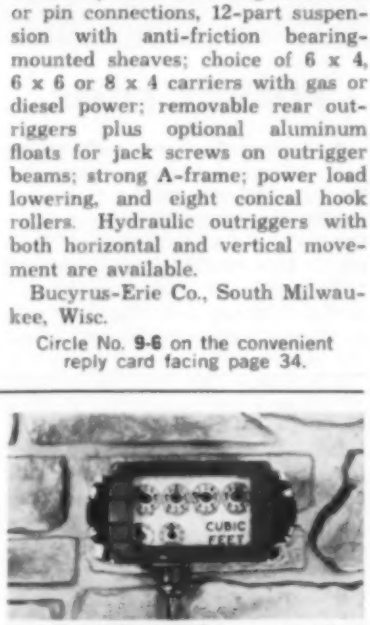
Visi-Meter, Inc., 301 North 17th Street, Kansas City 2, Kans.

Circle No. **9-5** on the convenient reply card facing page 34.



Register is located for easy reading.

Cable connected to 90 deg. take-off can run 16′ to the register location.

Helicopter

A 4-place business and utility helicopter, designated the Hiller E4, is powered by a 320 hp Lycoming engine, a more powerful version of the same engine that lifted a 12 E copter to a world record rescue at 18,000 feet on Mt. McKinley, Alaska, earlier this summer. The E 4 will climb vertically when fully loaded; verified climb rate is 820 feet per minute. This margin of power increases the versatility of the E 4 in two ways; it can do heavy duty hauling and lifting and provides a big margin of safety for executive and other high priority passenger transport.

Commercial Division, Hiller Aircraft Corp., Palo Alto, Calif.

Circle No. **9-7** on the convenient reply card facing page 34.

Radiophone

A small portable 100 milliwatt crystal controlled radiophone with receiver squelch, the VP-100, has an average range up to three miles. Operating on any one of the 22 channels of the citizen's band, it is fully transistorized and completely self-contained with exception of the lapel microphone. Two or more VP-100 units may be operated in communication or with base stations of 100 milliwatts of power without licensing. When used with 5 watt installations the class "D" license requirements apply to all units. Power is provided by one 9 volt 2U6 Burgess or 216 Eveready battery. Circuitry is printed on fiber-glass. The case is 1/16 in. thick drawn aluminum, measuring 3 in. wide, 1⅛ in. deep and 6 in. high. Telescoping antenna can be collapsed into case. The extension microphone clips to lapel or operates in the hand, actuating the transmitter with push-to-talk button located on the microphone case. The VP-100 operates with other portable or fixed station citizen's service radiophones.

Morrow Radio Manufacturing Co., Salem, Oregon.

Circle No. **9-8** on the convenient reply card facing page 34.

Refuse Transfer

The O'Connor Transfer System receives refuse from conventional collection trucks and compresses it hydraulically into trailer trucks. These trailer trucks are manned only by the driver, and can haul loads up to the maximum permitted by state laws. There is no delay in unloading collection trucks; the system can be designed to accommodate any volume, with a maximum loading time of fifteen minutes. The type and size of semi-trailers depend entirely on local conditions and allowable gross weights. In a majority of cases, the Transfer System will also effect savings in time of over fifty percent as compared to collection trucks covering the same distances.

O'Connor Transfer Systems, Inc., 331 Madison Ave., New York 17, N. Y.

Circle No. **9-9** on the convenient reply card facing page 34.

Space Heater

Greater productivity during cold weather is made possible by the "Hot Shot" portable space heaters. Five models range in size from 75,000 Btu/Hr to 450,000 Btu/Hr.

Equipped with strong handles and well-balanced on wheels, the space heaters are easily moved about and the heat directed where needed. All models have built-in atomizing equipment to permit the use of low-cost fuel oils. They are clean, safe, ventless, odorless and useful for work around walls, floors, scaffolds, indoors and outdoors, in warm or cold weather. The heat is produced instantaneously and the machine is automatic, having thermostatic control and an automatic low fuel cut-off switch.

Kelley Machine Div., Wiesner-Rapp Co., Inc., 285 Chicago St., Buffalo 4, N. Y.

Circle No. **9-10** on the convenient reply card facing page 34.

Grader Blade Control

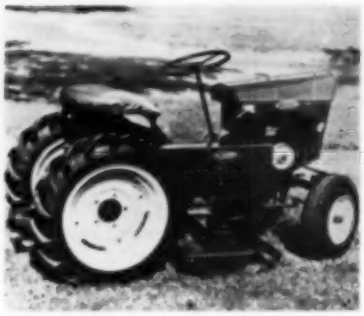
A glare-proof, easy-setting dial for the automatic blade control for motor graders is provided in which reflection is eliminated by the use of a black anodized aluminum dial panel. The index of the recessed dial is flush with the calibrated scales, making for easy and accurate dial setting from any position in the operator's compartment. On super-elevated curves, the dial can be gradually moved to the changing slope settings as the grader travels along. Controls are available for new or used motor graders. Replacement dial panels of the glare-proof design are also available.

Preco, Incorporated, 6300 E. Slauson Ave., Los Angeles, Calif.

Circle No. **9-11** on the convenient reply card facing page 34.

Rotary Mower

A 32-in. cut, underneath-mounted rotary mower which attaches to Model S-14 tractor (5¾ hp) is of the full-floating type which follows the ground contours. Will not scalp on rough ground. The mower can be attached or taken off the tractor in 15 seconds. Height of cut is adjustable from 1¼ to 4 in. Spindles operate in Timken roller bearings, and the entire unit is built around



a heavy-duty 14 gauge steel deck. Available with electric starter.

Speedex Tractor Co., Ravenna, Ohio.

Circle No. **9-12** on the convenient reply card facing page 34.

draining off of liquids, when permissible, at the dump. A 6-in. capped opening drain is standard also for cases where liquids must be drained prior to dumping load. All hydraulic operations are cab-controlled.

Cobey Corporation, Galion, Ohio.

Circle No. **9-13** on the convenient reply card facing page 34.

Utility Body

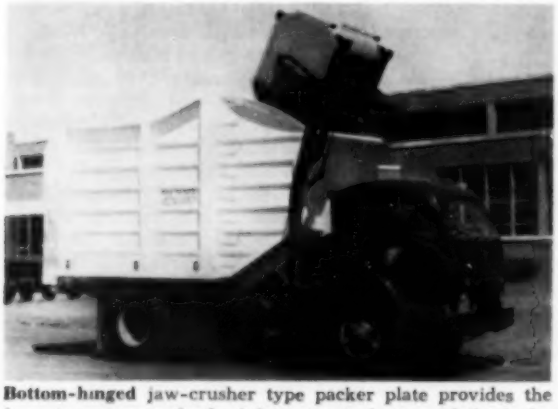
Special bodies, Series 460 and 460-EC, are designed to carry all tools needed for gas and water line work, pneumatic pavement breakers and tampers, welding equipment, solvents, lanterns, barricades and other tools and supplies in special compartments and in the 51″ x 96″ body cargo area. The body provides as standard equipment, shelf partitions and dividers, material hooks, adjustable shelves, recessed door handles, slam-action door catches, keyed-alike cylinder locks, removable endgate, safety-tread steel floor, rear stirrup steps and grab handles, superstructure with full length shelves and strap hold-downs for tanks. Options include a compact, winch-type air hoist for lifting and dragging jobs or towing a backfill scraper; and air-hose reel; and a water pump that mounts forward of the truck radiator. The Series 460 Body is 96″ long, 85″ wide and 67″ high. It is designed for installation on a chassis having 84″ cab-to-axle dimension. The Series 460-EC Body also designed for an 84″ CA chassis, is 130″ long with other dimensions the same as those of the 460.

McCabe-Powers Body Company, 5900 North Broadway, St. Louis 15, Missouri.

Circle No. **9-14** on the convenient reply card facing page 34.

Refuse Collector

A wet and dry refuse collector, the Cobey Pak-Tainer, comprises a truck mounted trash collecting and packing body, utilizing large capacity steel containers from 1 through 6 cu. yd. capacity, centrally located for pick-up. The unit is presently made in 27 and 30 cu. yd. capacities. Container pick-up requires only the truck driver, and the open-jawed, self-catching hooks on the lifting arms engage the lifting ears of containers. There is no dripping, or spilling of liquids over truck cab or pavement. Compaction force is in excess of 65,000 lbs. The heavily reinforced one-piece tailgate is hinged at the top and is raised upward by two hydraulic cylinders. The tailgate is locked in closed position by six holding latches, precluding the possibility of accidentally dumping the load. A built-in 150-gal. container is provided for



Bottom-hinged jaw-crusher type packer plate provides the force to compress the load from top to bottom of the body.

Designed to handle routine and emergency jobs, this body can carry tools, lanterns, barricades and special supplies.

Backhoe-Loader

The 90-degree angle operation of the Minneapolis-Moline 445 backhoe and its generous stretch make it especially suited to service lines and water department work since it can dig at sharp right angles, preventing the blocking of traffic on busy streets, even though it is necessary to dig out to the center of the street to reach the water main. The outfit is equipped with cabs on the tractor and over the backhoe to work in all kinds of weather. With power steering and visibility of work from the elevated seat on the backhoe, working is easier. The unit can dig around a pipe on both sides and leave little or no hand work, and then dump the bucket gently even when handling the stickiest of materials.

Minneapolis-Moline Company, Hopkins, Minn.

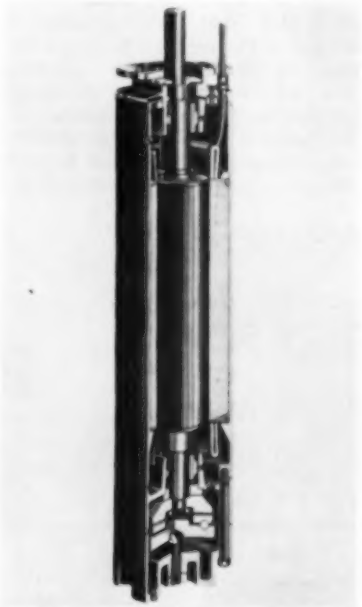
Circle No. **9-15** on the convenient reply card facing page 34.

Turbine Pump Motor

These water-cooled, water-lubricated motors rated from 30 to 250 hp, three phase, 60 cycle, 1800 rpm, for 10-inch or larger well casings are designed to be continuously submerged in water at a maximum temperature of 40 degrees C for deep wells, booster or process applications. With water used as the cooling and lubricating agent, pressure systems are eliminated; no oil or other fluid is used which can contaminate well water. The large surface area reduces danger of clogging with sand and silt. Shaft seals in the bracket force the water to travel along the shaft and through the filter. The epoxy coating on the windings is effective protection against any silt that may enter. The motor frame is a heavy-walled, seamless steel tubing. Epoxy coating provides protection against corrosion. Other features include low friction losses, long insulation life, special rotor and stator protection, self-aligning guide bearings, and simplicity of operation.

Westinghouse Electric Corporation, P. O. Box 2099, Pittsburgh 30, Pa.

Circle No. **9-16** on the convenient reply card facing page 34.



Bearings are designed to withstand the load of high thrust application.

Vibrating Roller

The Model 4T tractor-drawn vibrating roller has a 32 hp air-cooled gasoline engine complete with 12-volt battery, electric starter, generator, 35-gallon fuel tank and remote throttle control. This 8000-lb. vibratory roller develops 1600 vibrations per minute and will produce compaction forces equivalent to a 20-ton dead weight roller. Ideal for granular base material, soil stabilization projects, crushed stone, sand, etc., the 4T has been used on highway base courses and shoulders, air bases, missile sites, earth dams, and similar jobs where compaction specifications are rigid.

Western Equipment Div., Douglas Motors Corp., 1234 North 62nd Street, Milwaukee 13, Wisc.

Circle No. **9-17** on the convenient reply card facing page 34.

Ballast-Converter

A light-weight ballast unit that converts any NEMA-standard incandescent fixture to mercury in 1 minute, the Convertalume, weighs 14 lbs. and measures 6 13/16 in. in diameter as prescribed by NEMA for fixture heads. Made of aluminum to match standard fixtures inconspicuously, it is offered in both high and standard power factor in 100, 175, 250 and 400-watt capacity, with built-in locking type receptacles, top and bottom. Conversion is accomplished by inserting the Convertalume unit in any locking type receptacle designed to NEMA standards. The control is then re-inserted in the receptacle on the top of the ballast unit and a mercury lamp is inserted in the incandescent socket. A companion unit, fitted with a bracket for pole mounting where

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fixtures embody solid cast aluminum heads, or are pendant hung, requires an average installation of 10 minutes.

Precision Multiple Controls, Inc., 233 Chestnut Street, Ridgewood, N. J.

Circle No. **9-18** on the convenient reply card facing page 34.

Fog-Gun

The Fog-Gun provides an efficient fogging method for insect control. The Fog-Gun can combat indoor infestations between professional service calls. The gun is also used out of doors to clear large areas of mosquitoes, gnats and flies. The output of the gun is 3,300 cu. ft. of fog per second—enough to cover an area 100 ft. by 100 ft. with a fog 10 ft. deep in less than one-half minute.

Cylinders hold gas and insecticides for thermo-aerosol type of operation.

To the heat-generator head is attached a cylinder of L.P. (Propane) gas and a second cylinder which holds the insecticide solution. Setting the gun in operation requires only the opening of the L. P. gas valve and lighting. The gun is held by a pistolgrip handle, operates by brief pulls on the trigger, weighs 8 lbs. The L P gas cylinder is replaceable. The insecticide cylinder is refillable from a bulk supply. Three different insecticide formulations, for a variety of sanitation uses, are recommended by the manufacturer.

General Implement Corporation, Pinellas Airport, Clearwater, Fla.

Circle No. **9-19** on the convenient reply card facing page 34.

The best way to fight a woman is with your hat... grab it and run.
—John Barrymore

ONCE KNEW a guy who could boss a crew and build a road, but he had this blind spot. Couldn't see calcium chloride for dust. Or concrete. Changed his mind fast, though . . . and it made quite a story. Here's how the local newspaper reported it:

Fourteen Furious Housewives Force Dust Settlement

Fourteen housewives cooked up a traffic jam of tremendous proportions on Route 60 today. All of the women live on Old Mill Road, which by-passes the construction project now in progress on the highway. The road is gravel. The dust problem has been called "intolerable," and demands that it be corrected have been mounting in intensity since the detour was put into service late last month.

At 11 o'clock this morning, the women struck. Standing shoulder to shoulder across the full width of the road, they brought both east-bound and west-bound traffic to a dead halt.

At the conclusion of their 35-minute siege, lines were estimated to extend two miles in either direction.

"Operation dust mop" was an unqualified success. A highway department representative settled the issue by promising to settle the dust.

Conclusion: They treated the detour with chloride. The contractor rushed his highway through by using chloride in his concrete. Which proves that retreat is not the only battle plan that works with women. *Wyandotte Chemicals Corp., Wyandotte, Michigan. Offices in principal cities.*

Wyandotte CHEMICALS
MICHIGAN ALKALI DIVISION
HEADQUARTERS FOR CALCIUM CHLORIDE

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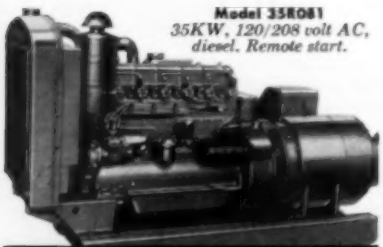

Model 35ER081
35KW, 120/208 volt AC, diesel. Remote start.

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Sandblaster

The unit known as the "HANDI-BLAST" Portable Sandblaster, is used for cleaning cement, rust and paint from tools and equipment. It leaves a clean, dry etched surface. The over-all height is 23 inches with a tank diameter of 7 inches. Weight is 23 pounds empty with an abrasive capacity of 30 pounds of sand. Features are: Built-in sand funnel; automatic opening and closing filler valve; air operating valve and fully adjustable sand flow valve. Core is

hardened and ground tool steel; mixing chamber mixes abrasive and air under tank. The air supply of the unit is consumed at the rate of approximately 8 cu. ft. per minute using the furnished 3/32" nozzle and the air supply from a 2 hp compressor. A 5/32" nozzle, also furnished, will consume approximately 20 cu. ft. per minute, requiring an air supply from a 5 hp compressor for satisfactory operation. The sandblaster operates with abrasives between 20 and 100 lb. mesh.

Handi-Blast Division, Hamill Manufacturing Company, Inc., Washington, Michigan.

Circle No. **9-20** on the convenient reply card facing page 34.

Floating Cover

This sludge digester floating cover is made of rectangular steel plates field-welded into a single deck without trusses to which a protected insulation is directly applied. The "MONODECK" cover is a statically determinate structure, basically simple in design and construction; the steel plates are ¼" thick; insulation is of 1½" fibreglass material to which a thin fibreglass

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. . . pure water is the lifeline of Municipalities and Industry.

For over 60 years, Roberts Filter Manufacturing Company has been complementing the engineering profession in supplying water purification equipment throughout the Western Hemisphere.

ROBERTS FILTER
Manufacturing Company
Darby, Pa.

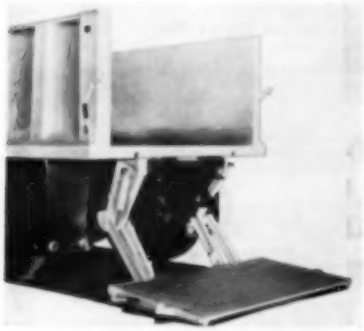
mineral surface roofing is added. A weighted pontoon around the periphery is a structural member designed for torsion, bending and compression. A single roller guide banishes possible sidethrust on the tank wall. This design minimizes tip and makes submergence impossible. The hazard of explosion between the cover and the roof is eliminated. Single plate construction reduces the dead load to 15 lbs. per sq. ft. Monodeck floating covers up to 60 ft. in diameter can be assembled complete outside the tank and lifted by a crane into position. Thus tank and cover can be constructed simultaneously.

Infilco Inc., Tucson, Arizona.

Circle No. **9-21** on the convenient reply card facing page 34.

Hydraulic Tailgate

The dual purpose combination dump body and Power Gate unit, known as "Load-N-Dump," features: A tailgate that works either as a standard dump body gate for dumping or a hydraulically-powered platform for loading and unloading and dual mounting of both the gate and the dump body on one chassis. With the gate in the closed position, the platform opens as a regular tailgate when the dump body is elevated. A latch locks the tailgate into the frame of the gate enabling it to function as a loading and unloading platform. Hydraulic systems for the gate and the dump body are independent. A two-shaft power take-off permits separate operation of either the gate or the dump body.



Gate opens, closes, raises or lowers hydraulically by independent system.

Daybrook Hydraulic Division, Young Spring & Wire Corporation, 500 Lehman Avenue, Bowling Green, Ohio.

Circle No. **9-22** on the convenient reply card facing page 34.

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FOR SALE

1 ea Pelton, 2 stage centrifugal pump, 20,000 GPM at 285 ft. TDH

1 ea Pelton, 2 stage centrifugal pump, 17,000 GPM at 285 ft. TDH

1 ea Westinghouse Synchronous motor, 1,600 HP, 600 RPM, 2,200 VAC, 3 ph.

1 ea Westinghouse Synchronous motor, 1,800 HP, 600 RPM, 2,200 VAC, 3 ph. (One coil burned out)

Pump and motor bases for above units

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Plus miscellaneous piping, flow and pressure instruments, ammeters, current relays, motor starters, transformers, and temperature indicator for pumping plant installation.

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Public Works Department
200 South Broad Street
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Civil Engineer capable of Nevada registration with experience in municipal engineering and administration required for community recently incorporated and released from federal control. Subdivision and planning experience desired. Starting salary $7,600 to $8,400 depending upon qualifications and experience. Send resume, required salary and earliest starting date to

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Boulder City, Nevada

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Washington State University
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compact, powerful, economical cable rodder. Ideal for removing roots, grease, sludge and general sewer waste. Four Sewerking cable models available with capacities from 250 to 600-feet.

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by Arthur K. Akers

★ **Robert E. Garrett** was elected president and chief executive officer of the United States Pipe & Foundry Co., Birmingham, Ala.,upon the retirement of **Claude S. Lawson.**

Mr. Garrett

Mr. Dickinson

★ **William E. Dickinson,** previously executive vice president and chief engineer of Calcium Chloride Institute, Washington, has been elected president. **George H. Kimber** is upped to chairman of the board.

★ The Ludlow Valve Mfg. Co. names **Robert J. Mettler** to oversee their sales in Ohio, Indiana and Kentucky from his Lima, Ohio, headquarters.

★ James B. Clow & Sons, Inc., announce joining forces with a 50-year old Australian company, General Industries, Ltd., to build a $3 million cast iron pressure pipe plant in Melbourne, Australia.

★ **William S. Kincaid** is now sales manager of all activities of the Goldak Co., Glendale, Calif., manufacturers of pipe locators and other electronic detection equipment.

★ Crane Carrier Corp., Tulsa, is awarded a $1,600,000 sub-contract to produce 111 military truck carriers for the U.S. Army Engineers. A negotiated contract, with the Quickway Truck Shovel Co. of Denver participating, is the basis.

★ Byron Jackson Pumps Inc. promotes **Harlan T. Thompson** to Northeast Regional Manager, New York; **Robert D. Christensen** becomes Northwest Regional Manager; and **Alexander Valchuk,** whom Thompson succeeds, returns to Los Angeles for "broader duties."

★ **Charles S. Brady** is promoted to sales manager, Irving Subway Grating Co., Long Island City, N.Y.

★ **Robert W. Allison** is named manager of advertising and public relations, Kraloy Plastic Pipe Co., Santa Ana, Calif.

★ **Ray V. Long** succeeds his father **Frank V. Long** as president of The Vapor Recovery Systems Co., Compton, Calif., following the latter's death in June.

★ Seaman-Gunnison Division of the Seaman Corporation has moved into their new building on the northwest side of Milwaukee.

★ Baughman Mfg. Co., Jerseyville, Ill., releases these items: **Allen A. Deverick** is appointed vice president in charge of sales; **Edward Brown** named central district sales manager, Indianapolis; **Zachary Dean** becomes western district sales manager, Tulsa.

★ **Jerry M. Magner** is appointed sales manager of the Water & Waste Division of the Fischer & Porter Co., Warminster, Pa. He will direct sales in their three major markets, which include water treatment equipment for swimming pools and municipal water and waste treatment systems.

Mr. Magner

Mr. Kemper

★ **Jackson Kemper** succeeds **W. H. Hipsher,** resigned due to health, as executive vice president of the Mueller Co., Decatur, Ill.

★ A complaining Georgia wife was awarded alimony, which her husband was soon behind with. Until she cornered him on the street with, "Look here, big boy, I is tired of messin' wid you. If you-all ain't catch up on dem payments fast I is goin' to repossess you!"

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*Recent unsolicited reports from eight ENTERPRISE power plant installations showed an average of 15,112 BHP hours per gallon of lube oil.

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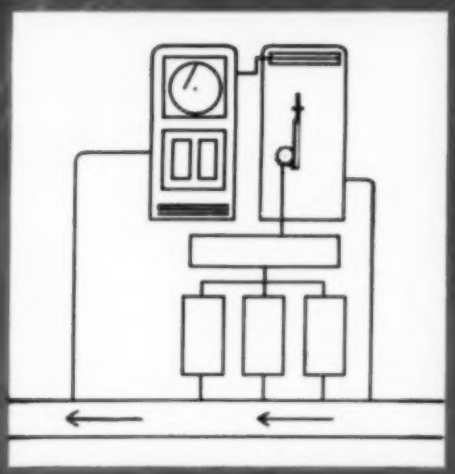

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Chlorinator feed rate is adjusted by two signals: one from water flow, the other from continuous, automatic residual analysis. Since feed rate is the product of these signals, Compound-loop Control gives you a range of greater than 100:1. No matter how much flow or demand changes, your system always maintains the selected residual.

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